ATI Radeon X1950 Pro | Ergodex DX1 | Enermax Galaxy EGA1000EWL | Asus EN7900GS TOP/2DHT/256M

A Sandhills Publication

CPU®
COMPUTER POWER USER

Our First Brush With Nvidia's GeForce 8800 GTX (page 30)

Four's Company:
Our First-Look Kentsfield Preview Inside!
(page 26)

Media Software Dustup:
Nero 7.5 vs. Roxio 9
(page 73)

iTunes 7:
More Than Just A New Coat Of Paint
(page 77)

Do-It-Yourself SERVER

Build Your Own Web/Email/FTP/Media/File/LAN Party Box

page 50

This Mod Hits Close To Home On Page 38

Q&A With Peter Frampton

Old-School Guitar Wizardry In The New Digital Realm

(page 108)

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CPU
COMPUTER POWER USER

December 2006 • Vol 6 Issue 12

Spotlight

50 **Serverama**
Think Outside The Desktop

52 **Your Gateway To The World**
What You Need To Build Your Own Web/Email/FTP/Game Server

60 **One For All**
Build A LAN/Media Server

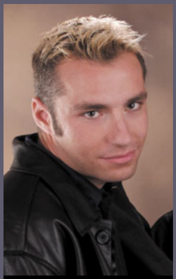
65 **Game On**
Build A Dedicated Game Server

Frontside

6 **What's Happening**
12 **Digital Economy**
14 **The Saint**
Games Become The Dominant Media Form

The Experts

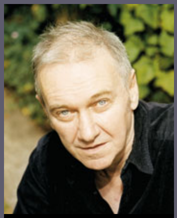
Alex St. John
The Saint
Page 14

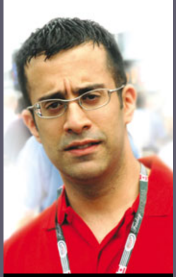

Alex "Sharky" Ross
The Shark Tank
Page 33

Anand Lal Shimpi
Anand's Corner
Page 32

Barry Brenesal
The Cutting Edge
Page 91

Rob "CmdrTaco" Malda
The Department Of Stuff
Page 83


Mike Magee
Shavings From The Rumour Mill
Page 97


Rahul Sood
Wagging The Dog
Page 98

Pete Loshin
Open Sauce
Page 79

Chris Pirillo
Dialogue Box
Page 78

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Did you find the hidden *CPU* logo on our cover? Turn the page for the answer.

Page 24

Heavy Gear

16 **Dream Hardware**

18 **The Ears Have It**
A Trio Of Musicphone
Headsets Compared

19 **All The Better To See You With**
These Aren't Your Garden-Variety
Web Cams

24 Enermax Galaxy EGA1000EWL
Caldigit S2VR Duo

25 Abit AW9D-MAX
Plextor PX-608U

26 Intel Core 2 Extreme QX6700
First Look Preview
Shuttle XPC P2 3700

27 Ergodex DX1
Asus GeForce EN7900GS
TOP/2DHT/256M

28 Logitech Wireless DJ System
Asus P5NSLI

29 ATI Radeon X1950 Pro

30 Cyberpower Gamer Infinity SLI KO

32 **Anand's Corner**
Quad-Cores Are Coming, When
Will You Need Them?

33 **The Shark Tank**
Watching The Screens Go By

Page 28

Microsoft
Flight Simulator X
Page 87

Hard Hat Area

PC Modder

34 **Tips & Tutorials**
35 **Balance The Equation**
Tweaking An Already
Overclocked PC
38 **Mad Reader Mod**
There's Something Familiar
About This Mod

41 **Advanced Q&A Corner**
44 **X-Ray Vision: NASA's Orion**
Retro Rockets, Indeed
46 **White Paper: 4x4**
AMD Takes Aim At The Enthusiast Market

Loading Zone

68 **The Bleeding Edge Of Software**
Inside The World Of Betas
69 **Up To Speed**
Upgrades That'll Keep You
Humming Along
70 ***Way* Offsite Backup**
A Look At Six Internet Backup Services
73 **The Battle Burns On**
Nero 7.5 Ultra Edition vs.
Roxio Easy Media Creator 9
75 Movavi VideoSuite Edition 3.1
Siber Systems RoboForm2Go 6.7.9
76 Paragon Software Group Partition
Manager 8.0 Personal Edition
InterVideo iVideoToGo Platinum
77 Apple Computer iTunes 7
78 **Dialogue Box**
The Greatest Gift Of All
79 **Open Sauce**
Need & Want

Caught In The Web

80 **The Power Of Ajax**
Applications Come To The Web
83 **The Department Of Stuff**
icasting.txt

Digital Living

84 **Road Warrior**
Mo' Better Batteries, New iPod nano
Accessories, Wikipedia To Go & More
86 **At Your Leisure**
Games, Gear, Movies & Music
91 **The Cutting Edge**
N-KB3

Tips & Tricks

93 **Software Tips & Projects**
Viva Vista
95 **Warm Up To Penguins**
Using Cedega To Play Windows
Games In Linux

What's Cooking

97 **Shavings From The Rumour Mill**
I Hope My Dream PC Won't
Be A Nightmare
98 **Wagging The Dog**
Voodoo Acquired By HP
102 **Technically Speaking**
An Interview With Craig Cuddeback,
Senior Vice President Of Cleantech
Capital Group
106 **Under Development**
A Peek At What's Brewing
In The Laboratory

Back Door

108 **Q&A With Peter Frampton**
Old-School Guitar Wizardry In The
New Digital Realm

CORRECTIONS:

On page 30 of the November issue, a typo in the accompanying chart made it seem as though the XFX GeForce 7950 GX2 managed just 7fps in running F.E.A.R. at 1,600 x 1,200. The card actually posted 74fps, as shown in the chart on page 22.

Infinite Loops

Strange stats and other oddball items from computing's periphery

82, 94, 96

EDITOR'S NOTE

It hardly seems possible, but it's now been just over a year since Samit packed his bags for un-sunny Washington state and passed the *CPU* baton my way. In those scant 12 months, we've seen dual-core CPUs give way to quad-core chips, dual-GPU graphics setups step down from the pinnacle of high-end system design in favor of Quad-SLI configs, and Intel CPUs muscle their way back onto the desktop performance throne.

Yep, it's been a busy year, and 2007 looks to be even busier, if you can imagine that. We hope you've enjoyed flipping through these pages each month, and we look forward to spending more time with you in the coming year.

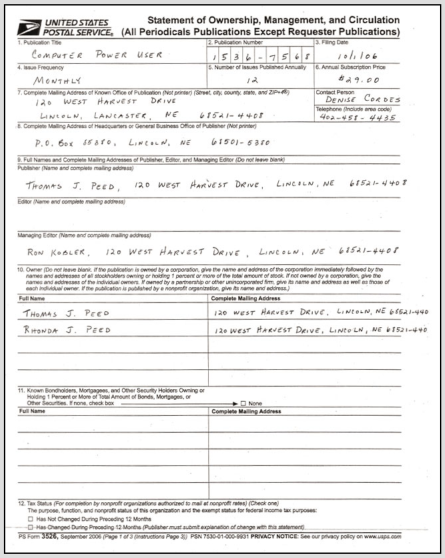
In the meantime and in the spirit of the holidays, we coerced our columnists into sharing some of their dearest wishes for the season with you; you'll find their wish lists throughout the issue. I've even put together a list of my own, in no particular order:

Holiday Wish List

1. Peace on earth, and goodwill toward men.
2. Product release dates that jibe perfectly with *CPU*'s print schedule.
3. Four words: World Champion Minnesota Vikings.
4. The Sword of a Thousand Truths.
5. A 2007 Harley V-Rod (Black Pearl).

Happy Holidays, we'll see you in January!

Chris Trumble, Publication Editor, *CPU*



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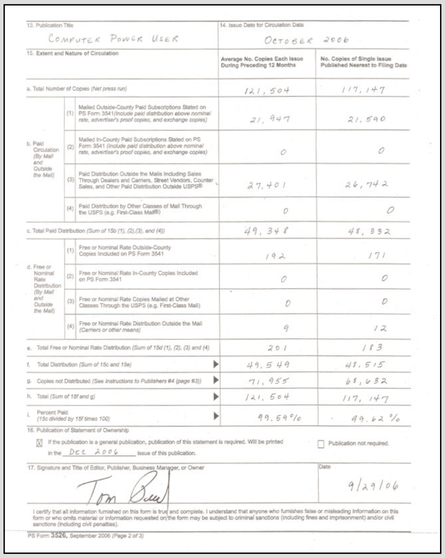

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PS Form 3526, September 2006 (Page 2 of 3)

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Gotcha.
Here it is.

EPP Enhanced Performance Profiles

Cool Performance

HOW CORSAIR MAINTAINS
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PERFORMANCE

RELIABILITY

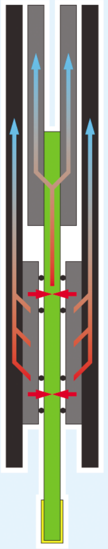
Here's the latest in Corsair's ten year heritage of innovation in performance memory: we've redefined memory heat sink technology. And the result is unprecedented performance and reliability. When we ran a preview module through system benchmarks at COMPUTEX, an overclocked DHX module with our optional airflow fan was able to hit a heart-stopping 1250MHz (PC-10,000) while maintaining cool, reliable performance.

Protect Components While You Push Performance

Pushing performance specs generates heat, and that can compromise reliability and component life. The advanced cooling ability of DHX heat sinks keeps your memory safe and reliable even as you push it to the limit. Under the name XMS2 Dominator, this DHX technology will be showing up on both Corsair parts designed for extreme overclocking and on memory designed for performance computing and gaming.

Also Featuring Enhanced Performance Profiles (EPP)

As with all new Corsair performance memory, XMS2 Dominator modules feature EPP, the new open standard for the Serial Presence Detect (SPD) jointly developed by NVIDIA and Corsair. EPP simplifies overclocking for beginners and provides unparalleled control for experts.



AIRFLOW

An optional fan (not shown) provides even more cooling and protection.

DHX DUAL-PATH HEAT XCHANGE

Corsair's proprietary DHX technology dissipates heat two ways: it draws heat away from the module through the RAMs and provides an additional path for heat transfer within the module through the ground plane!

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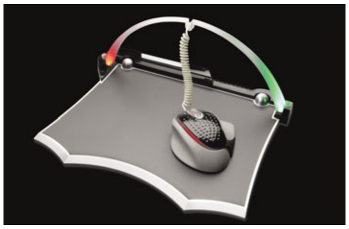
What's Happening • Hardware

Compiled by Steve Smith

Get Creative With Digital Music

Digital music is enormously convenient, but you don't need to be an audiophile to notice the diminished fidelity of many iTunes, MP3, WMA, and AAC tracks. Creative is offering its novel Xmod right before Christmas as a way to punch up the low and high frequencies that compression techniques often muddy. The candy bar-sized device sits between a PC or MP3 player and its speakers or headphones. The $79 Xmod enhances the sound with the same CMSS-3D and Crystalizer effects as the peerless X-Fi line of audio cards. Creative says its new gadget can push MP3 audio beyond CD quality. Well, we'll believe *that* when we hear it. ▲

Attack Of The Weird Mice



As 11th-hour Santas scramble for gift ideas, the peripheral manufacturers obliged this year by flooding the market with offbeat peripherals. To wit: Strange mice are scampering across users' desktops this year, including the Fanatec Heäd$hot ($99; www.fanatec.com) controller for those obsessed with gaming. Boasting a 2,000dpi, ultra-sensitive laser sensor, low-friction plasma-Glyde mouse feet, customizable ergonomics, and a lighted cable arch that keeps cords away from your feverish gameplay, we thought the Heäd$hot was the absurd limit in mice. That is, until we saw Iogear's Germ Free Laser Mouse ($39.95; www.iogear.com), which uses a titanium dioxide and silver nano-particle compound to neutralize bacteria-causing enzymes from human hands. For medical settings or LAN party gamers who pass around their mouse to sniffling Doomers, this is the must-have antiseptic peripheral of the season. ▲

Fanatec's tricked-out Heäd$hot model and Iogear's Germ Free Laser Mouse redraw the lines of lunatic fringe peripheral excess.

Tower Speakers To Go

As if the 15-pound multimedia behemoth notebooks aren't stretching the limits of "portability" to begin with, Buffalo adds to the tonnage with its new model BSPL-MU09N/SV notebook speakers. Powered by your USB port (say bye-bye, battery life) and connected to your line-out audio jack, each of these mini-towers runs a mere 0.5 watts per channel. At just under $40, the add-on is cheap enough, but at a half-watt per channel, we're wondering whether headphones aren't a better audio option in the end—did we mention that $1,500 ("Headphones That Go Around [& Over] Our Heads") will buy you ear pads with Ethiopian sheep hair? ▲

Buffalo's new side mounting speaker set is the perfect add-on for notebook owners who really have nowhere to take their oversized portable PC anyway.

What's the best bargain this Christmas, 5.1 headphones for $129 or $1,500 headphones?

Headphones That Go Around (& Over) Our Heads

As with controllers, the holiday wish list for headphones got zanier this Christmas. We've been disappointed in previous attempts to shrink 5.1 speakers into a set of cans, so we wish Razer luck in stuffing eight discrete audio drivers into its Barracuda HP-1 model ($129; www.razerzone.com) to re-create surround sound in games. And will six channels of sound be better than two from the outrageously extravagant $1,500 Ultrasone Edition 9 (www.ultrasoneusa.com) headphones with titanium mylar drivers and a frequency range of 8Hz to 35KHz. But who's going to drop $1,500 on cans without some silly extra? The Edition 9s not only come in their own metal attaché case, but the ear and headband pads are made of Ethiopian sheep hair to maximize comfort. Baaa! Humbug! ▲

Hardware Mole

Lenovo's Space-Age WebCam

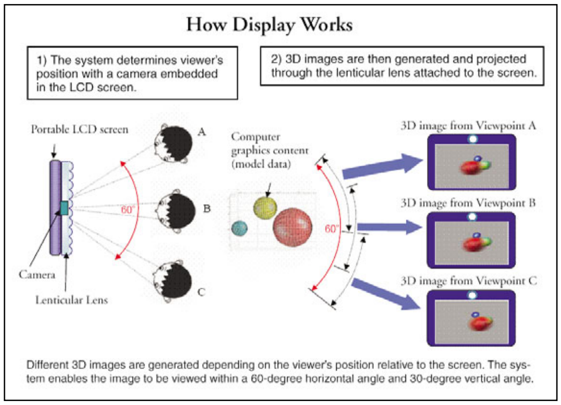
The Lenovo ThinkPad line is one of our favorite, understated notebook designs, and its new USB WebCam ($79.95; www.lenovo.com) has the same sleek, ebony, down-to-business styling. The 1.3MP cam gets a sliding cover for dust protection and inadvertent broadcasts from your hotel room. We especially like that this model has dual microphones to focus on voices and keep those videoconferences from sounding like they are beaming in from Mars. ▲

The Seagate/Maxtor Nuptials: Divide Duties, Keep Maiden Names

In the wake of its recent acquisition of Maxtor, Seagate says it will maintain separate brands and dedicate each to somewhat different target markets. The new Maxtor DiamondMax and MobileMax drives will serve midrange size and speed requirements for system builders and resellers. Meanwhile, Seagate-branded storage, such as the new 750GB SV35.2 series drive for video security, will target the high-performance market. ▲

Flat Screens Go Deep

For as long as we have covered monitors, every few years another new idea crops up for 3D displays that doesn't require special, goofy glasses. Japan's NTT DoCoMo says it has prototyped a 7-inch LCD that not only renders an illusion of depth to the naked eye but also uses an internal camera to detect the user's viewing angle in order to optimize the effect. A lenticular lens on the display projects different 3D views according to where the user sits in relation to the screen. ▲


How Display Works
1) The system determines viewer's position with a camera embedded in the LCD screen.
2) 3D images are then generated and projected through the lenticular lens attached to the screen.
Portable LCD screen
Camera
Lenticular Lens
A
B
C
60°
Computer graphics content (model data)
60°
3D image from Viewpoint A
3D image from Viewpoint B
3D image from Viewpoint C
Different 3D images are generated depending on the viewer's position relative to the screen. The system enables the image to be viewed within a 60-degree horizontal angle and 30-degree vertical angle.

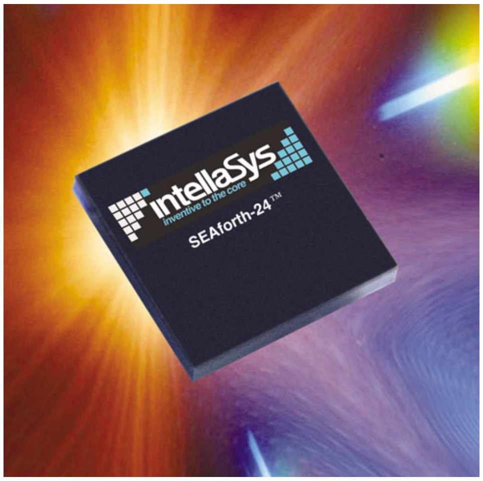
Unlike other 3D monitor systems, NTT DoCoMo has created an LCD designed to project the illusion of depth at a variety of viewing angles.

What's Happening • Chip Watch

Compiled by Dean Takahashi

IntellaSys Tries 24-Core SEAforth Chips That Revive An Old Language

In the 1960s, Chuck Moore invented the Forth programming language that became known for its code efficiency. Now his company, IntellaSys, has created a chip using his code to efficiently handle media processing tasks such as audio, voice, and video applications. The SEAforth chip has 24 processors on a single chip, 30 instructions, and uses asynchronous logic. The company launched the chips earlier this year but just recently unveiled a compiler and simulator to support programmers using the SEAforth chips in embedded applications. Moore says the Forth language is key to creating chips that can achieve performance of 24 billion operations per second with power consumption of just 150mW. ▲



IBM To Take Power6 Chips To 5GHz

IBM has created the Power6 microprocessor for high-end servers and mainframe computers at speeds ranging from 4 to 5GHz (more than double the speeds of its Power5 predecessors), says Brad McCredie, chief engineer of the Power6 chip. The microprocessor will also be energy efficient thanks to a variety of power-saving features IBM's implementing in the chip. The 65nm Power6 chip has only 13 stages in its pipeline, letting IBM ratchet up the speed, but McCredie says that Power6 will also have new architectural features. The new features will help the chip compete with Intel's Itanium 2 microprocessor, which runs at 1.6GHz. McCredie says that the new Power6 core will include instructions for new features such as decimal floating point accelerators, making it much more useful in applications such as financial modeling. The Power6 chips will debut in IBM servers in mid-2007. ▲

Intel Foresees Day When New Material Can Cut Leakage By 99%

In a speech at the Fall Microprocessor Forum 2006, Intel architect Dileep Bhandarkar said that a change in materials Intel uses to make chips could cut leakage, a major problem in today's power-hungry chips, by as much as 99%. The use of an as-yet-unspecified high-k dielectric material could replace silicon dioxide as the gate oxide layer between a silicon substrate and a gate in a typical transistor on a chip. Bhandarkar said that the silicon dioxide layer has hit its limits and is one of the reasons why leakage of current, and as a result power consumption, is going up. Silicon dioxide layers are now just a few atoms thick. With a thicker insulating layer using the high-k dielectric material, Intel can reduce the leakage. Bhandarkar also said Intel has been researching the technology and has built working test chips; however, he could not predict when Intel will use the technology in real-world products. ▲

Watching The Chips Fall

Here is pricing information for AMD and Intel CPUs.

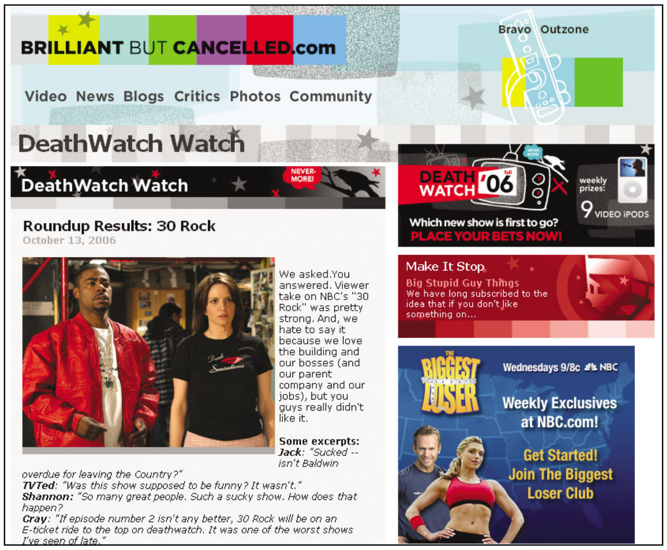
*Retail price
** Manufacturer's price per 1,000 units
Other current prices, if indicated, are lowest OEM prices available through Pricegrabber.com

CPU	Released	Original price	Last month's price	Current price
AMD Athlon 64 FX-62	5/23/2006	$1,031**	$794	$674
AMD Athlon 64 X2 Dual-Core 3800+ AM2 only	8/1/2005	$354**	$158	$161
AMD Athlon 64 X2 Dual-Core 4200+ energy efficient	5/16/2006	$417**	$185	$183
AMD Athlon 64 X2 Dual-Core 4200+ AM2 or 939	5/31/2005	$537**	$209	$215
AMD Athlon 64 X2 Dual-Core 4400+ energy efficient	5/16/2006	$514**	$487	$487
AMD Athlon 64 X2 Dual-Core 4600+ energy efficient	5/16/2006	$601**	$249	$235
AMD Athlon 64 X2 Dual-Core 4600+ AM2 only	5/31/2005	$803**	$240	$235
AMD Athlon 64 X2 Dual-Core 4800+ energy efficient	5/16/2006	$671**	$670	$670
AMD Athlon 64 X2 Dual-Core 5000+ AM2 only	5/23/2006	$696**	$375	$471
AMD Athlon 64 X2 Dual-Core 5200+ AM2 only	9/6/2006	$827**	$827**	$599
Intel Pentium Processor Extreme Edition 955 3.46GHz dual-core	12/27/2005	$999**	$988	$749
Intel Pentium Processor Extreme Edition 965 3.73GHz dual-core	3/22/2006	$999**	$999**	$975
Intel Pentium 4 651 3.4GHz 2MB cache 800MHz FSB 65nm	12/27/2005	$273**	$183	$180
Intel Pentium 4 660 3.6GHz 2MB cache 800MHz FSB 90nm	2/21/2005	$605**	$277	$277
Intel Pentium 4 661 3.6GHz 2MB cache 800MHz FSB 65nm	12/27/2005	$401**	$183	$192
Intel Pentium D 920 2.8GHz dual-core 2MB 800MHz FSB 65nm	12/27/2005	$241**	$159	$165
Intel Pentium D 930 3GHz dual-core 2MB 800MHz FSB 65nm	12/27/2005	$316**	$160	$156
Intel Pentium D 940 3.2GHz dual-core 2MB 800MHz FSB 65nm	12/27/2005	$423**	$190	$188
Intel Pentium D 950 3.4GHz dual-core 2MB 800MHz FSB 65nm	12/27/2005	$637**	$231	$215
Intel Pentium D 960 3.6GHz dual-core 2MB 800MHz FSB 65nm	5/1/2006	$530**	$339	$319
Intel Core 2 Duo E6300 1.86GHz 2MB cache 1,066Mhz FSB 65nm	7/27/2006	$183**	$184	$179
Intel Core 2 Duo E6400 2.13GHz 2MB cache 1,066Mhz FSB 65nm	7/27/2006	$224**	$224	$219
Intel Core 2 Duo E6600 2.4GHz 4MB cache 1,066MHz FSB 65nm	7/27/2006	$316**	$325	$313
Intel Core 2 Duo E6700 2.66GHz 4MB cache 1,066MHz FSB 65nm	7/27/2006	$530**	$539	$494
Intel Core 2 Duo X6800 2.93GHz 4MB cache 1,066MHz FSB 65nm	7/27/2006	$999**	$998	$910

Compiled by Blaine Flamig

What's (Not) On TV Tonight?

There's a special place in the afterlife waiting for those wanker TV execs who cancel brilliant (but little-watched) TV shows. Ratings, schmatings. "The Ben Stiller Show," "Freaks and Geeks," "Arrested Development," "Cop Rock". . . OK, they got that last one right, but would it have killed CBS to give Ray Liotta's "Smith" a few more weeks before chopping its head off? To help fill the vacant slots in your TV viewing schedule, check out BrillantButCancelled.com, an offshoot of Bravo's Web site. The site has a lot of great content, but play the DeathWatch Watch '06 game. Just enter an email address, bet on which network show will get its walking papers next, and you could win an iPod or 37-inch Aquos flat-panel HDTV. After all, if you watch a show that gets the permanent fade-to-black treatment, you should be rewarded. ▲


BRILLIANT BUT CANCELLED.com
Bravo Outzone
Video News Blogs Critics Photos Community
DeathWatch Watch
DeathWatch Watch
NEVER-MORE!
DEATH WATCH '06
weekly prizes: 9 VIDEO iPODS
Which new show is first to go? PLACE YOUR BETS NOW!
Make It Stop
THE BIGGEST LOSER
Wednesdays 9/8c NBC
Weekly Exclusives at NBC.com!
Get Started! Join The Biggest Loser Club

Roundup Results: 30 Rock
October 13, 2006

We asked.You answered. Viewer take on NBC's "30 Rock" was pretty strong. And, we hate to say it because we love the building and our bosses (and our parent company and our jobs), but you guys really didn't like it.

Some excerpts:
Jack: *"Sucked -- isn't Baldwin overdue for leaving the Country?"*
TVTed: *"Was this show supposed to be funny? It wasn't."*
Shannon: *"So many great people. Such a sucky show. How does that happen?*
Cray: *"If episode number 2 isn't any better, 30 Rock will be on an E-ticket ride to the top on deathwatch. It was one of the worst shows I've seen of late."*

Big Stupid Guy Things
We have long subscribed to the idea that if you don't like something on...

Site Seeing

Magnificent Movie Mashes

What do you get when you mash "Snakes On A Plane" with "Fight Club"? "Psychopath On A Plane," of course. What about a naked Will Ferrell running through M. Night Shyamalan's "The Village"? That would be "The Old School Village." We've been fans of audio mash-ups for some time (especially The Beast Gees, a Beastie Boys-Bee Gees mash), but The Trailer Mash's (www.thetrailermash.com) creations might be even better. Besides mashes, the site's mad geniuses also rework clips to create trailers that put a new spin on the original flicks, such as "How Scarface Got His Groove Back," "Fletch" (the thriller), and "Napoleon Dynamite" (a sci-fi drama, "Donnie Darko" style). Sweet. ▲

You've Just Been Bluf'd

Pretty smart, are you? Then prove it at Blufr (www.blufr.com), a free game from the folks at Answers.com. Answer the site's obscure trivia questions and watch your score go up or down. Blufr is oddly addicting because the questions are truly interesting. For example, "Singer Rob Zombie, from the band White Zombie, worked on the 'Pee-Wee Herman Show.' Way? No Way?" Answer enough questions correctly and you'll make the big scoreboard. You can also post your own blufs and embed Blufr on your own site. (As for Rob Zombie? Way. He was a production assistant, which helps explain "The Devil's Rejects.") ▲

Just In Time For Christmas

This being *CPU*'s December issue, we'd be remiss if we didn't share some Christmas cheer. For a few "Why do we do this to our children?" moments, the old Internet-favorite "Scared of Santa Photo Gallery" never gets old (Google the title for sites hosting it). Elsewhere, as you'd expect, Wikipedia's Christmas and Santa Claus entries are incredibly informative and thorough (en.wikipedia.org/wiki/Christmas; en.wikipedia.org/wiki/Santa_claus). If you have children, help them track Santa's journey at NORAD (www.noradsanta.org/index.php), now in its 51st year of tracking. Finally, there's proof that Santa is down with technology at santaclauslapland.fi, where you can order a mini DVD Christmas card from Santa for your kids, complete with postmark from Santa's post office at the Artic Circle in Lapland. ▲

Compiled by Steve Smith

Google's Goosed Gadgets

Putting dynamic, interactive applications in Web pages is the hot programming trend this year (see page 80 for more info), and the coolest example is Google's new Gadgets for Web pages. You can add to your own blog page, Google home page, or any Web site modules that pull in live weather, daily fortune cookies, a Pac Man game, or a host of other widgets. Because Google released an API that lets anyone develop and syndicate these programs, you can drill into the mushrooming library to find countless new user-generated widgets. ▲

From Bejeweled to moon phase reports, Google's new Gadgets are Web-based applications that drop directly into your Web site or Google personal page.

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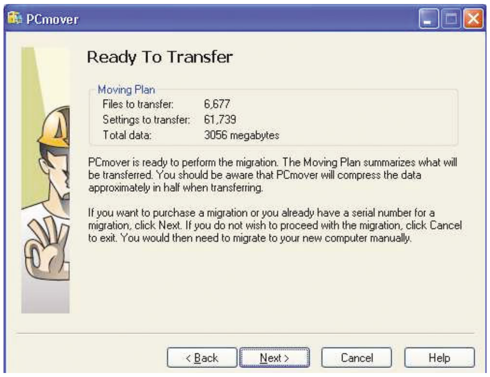
Going way beyond Dragon's Lair, the latest iteration of movie-like adventure lets you control your character's emotions to move the comedy storyline along different paths.

Play It With Feeling

Anyone who recalls the lame gameplay of Dragon's Lair may cringe at the thought of yet another "interactive" animated film using Disney stylings. But entertainment company Cecropia promises that The Act will be different. Under field test now in Boston-area arcade machines, the game is hand-drawn by former Disney animators and uses a knob to control the hero's emotional response to a situation. How much you turn the knob determines how intensely the main character, Edgar, interacts with others and in turn, how they respond to him. What a perfect game for a therapeutic age. It's all about feeling. ▲

Movin' On Up Made Easier

The only bad thing about building or buying a new PC (other than paying for it) is transferring data from the old PC to the new one. Laplink's PCmover ($49.95; www.laplink.com) automates the transfer of files, settings, and even installed programs to the new unit in a single exchange. It compares new and old PCs, decides what is and isn't needed on the old PC, and pushes the info over USB/parallel cables, a network, or burned discs to the new computer. We were missing a few things in our test (like Outlook Express emails), but otherwise the program re-created our old Desktop, file structure, and portfolio of programs. We didn't need to fish out a single installation CD or those blasted serial numbers. ▲



Ready To Transfer

Moving Plan
Files to transfer: 6,677
Settings to transfer: 61,739
Total data: 3056 megabytes

PCmover is ready to perform the migration. The Moving Plan summarizes what will be transferred. You should be aware that PCmover will compress the data approximately in half when transferring.

If you want to purchase a migration or you already have a serial number for a migration, click Next. If you do not wish to proceed with the migration, click Cancel to exit. You would then need to migrate to your new computer manually.

Laplink's new PCmover lets you move files, settings, and even installed programs from an old PC to a new one.

Software Shorts

"South Park" Saves Warcraft?

Cartman, Kyle, Stan, and Kenny are just as addicted to their PCs as we are in the opening episode of the 10th season of "South Park." In a curious partnership with Blizzard Entertainment, the hit series has its foul-mouthed kids save the World Of Warcraft from a rogue gamer who outsmarts even the WoW programmers. According to reports, the "Make Love, Not Warcraft" episode benefited from technical advice from the WoW staff. And yes, you guessed it: "Oh my God, he killed Kenny" figures prominently in this script. ▲

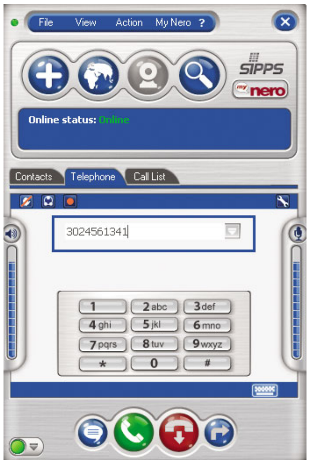
The "South Park" gang becomes MMORPG addicts to bring down a renegade player in the World Of Warcraft.

McAfee & Norton Want To Unlock Vista

Security software firms are complaining that Microsoft is locking them out of the upcoming Windows Vista OS so that it can have the security field all to itself. A full-page McAfee ad in the *Financial Times* claimed third parties were being denied necessary access to the OS kernel code in order to construct reliable security for Vista. Microsoft, which recently started selling its own malware protection suite, countered that it was just trying to keep the new OS more secure. However, the company ultimately decided this past October to give third parties appropriate keys to the code. ▲

Nero 7 Gets Ultra Enhanced

How much larger can multimedia suites get? Nero 7 ($79.99; www.nero.com) is not only Ultra, but now it's Ultra *and* Enhanced with a VoIP module for Internet calling and a DVR for playing and recording input from a TV tuner. For anyone who recalls when Nero was just a disc burner, that core product now writes to Blu-ray, HD DVD, and DVD-Audio discs. Good to know Nero hasn't forgotten its roots. (Check out our Nero 7.5 Ultra Edition vs. Roxio Media Creator 9 roundup on page 73.) ▲



Online status: Online

3024561341

The next obvious step for a legendary disc burner like Nero? Internet calling, of course.

BIOS Upgrades Available Online

Compiled by Steve Smith

Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new lease on life. Here are a few recently released upgrades. Readers can check out www.cpumag.com/cpudec06/bios to see our entire upgrade list.

Motherboard	Date Available	URL
Abit IL-90MV	8/29/2006	www.abit-usa.com/downloads/bios/il90/il9012.zip
ASRock AM2NF6G-VSTA	10/2/2006	download.asrock.com/bios/AM2/AM2NF6G-VSTA(1.40)Win.zip
Asus P5VD2-MX	9/20/2006	ftp://dlsvr03.asus.com/pub/ASUS/mb/socket775/P5VD2-MX/P5VD2MX0902.zip
ECS P965T-A	9/15/2006	www.ecs.com.tw/ECSWeb/Downloads/ProductsDetail_Download.aspx?CategoryID=1&Typeid=32&detailid=681&DetailName=Bios&DetailDesc=P965T-A&MenuID=35&LanID=9
Gigabyte GA-965P-DS4	9/20/2006	america.giga-byte.com/FileList/BIOS/motherboard_bios_ga-965p-ds4_f5.exe
Shuttle SD37P2	9/5/2006	ftp://ftp.shuttle.com/BIOS/sd37p2/sd37s023.bin
Tyan Thunder h2000	9/22/2006	ftp://ftp.tyan.com/bios/S3992_102.zip

Compiled by Steve Smith

The Job Search

Nowadays it's hard to get away from MTV because it blasts us from multiple cable channels, new broadband initiatives like Overdrive, and even made-for-mobile phone content. You could be the guy responsible for giving us even more. MTV is looking for a new VP of Technology, someone who can manage its massive empire of Web sites and digital product lines. MTV goes beyond the rock music brand. It also produces Nickelodeon, VH1, CMT, Comedy Central, and more than a dozen other multiplatform brands. Your job is to oversee the Internet properties and provide leadership and new product ideas, but also be knowledgeable enough to handle coding issues. The job pays a cool $125,000 a year and puts you in sunny Glendale, Calif. You'll need five years' experience managing large-scale Web operations and technical background in Flash, MySQL, Apache server, Linux, and more. And then, of course, there are the perks: hearing bad music before it releases, a lot of rock T-shirts, and hearing what all of those foul-mouthed rock stars say at the Video Music Awards before the network bleeps them—OK, maybe there aren't any real perks.

18.5 hours

Average time PC gamers play each week

Parks Associates

13.6 HOURS

Average time console gamers play each week

Parks Associates

6.3 billion

Number of online searches in the United States during July 2006

comScore

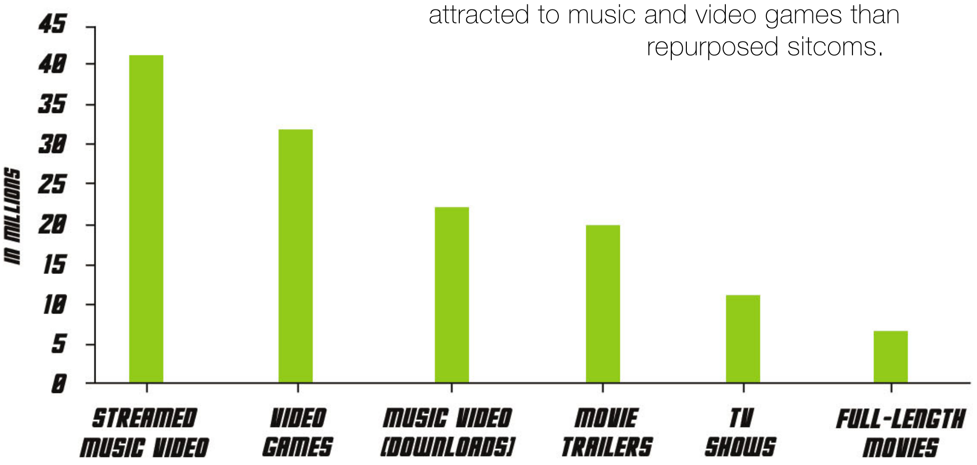
5 MILLION

Number of cellular modems sold this year

In-Stat

U.S. Online Video Users By Type

The major TV networks are following the eyeballs online this season, pouring as much prime-time fare as they can into streaming media. But what do users say is their must-see Web TV? According to Ipsos Insight, in June 2006 we were more attracted to music and video games than repurposed sitcoms.



Source: Ipsos Insight

Power your imagination

Seasonic M12 Series Modular PSU
500W, 600W, 700W
Super Performance, Reliability, and Flexibility for Hardcore Pros.

Detachable Modular Cable Design.
Dual Magnetic Amplifiers.
Quiet Dual Fan Cooling.

Seasonic®
www.seasonicUSA.com

Fry's Electronics Outpost.com
newegg.com®
pcalchemy The HTPC Store.
DIRECTRON.COM
ZipZoomfly.com

Games Become The Dominant Media Form

We live in exciting times in the game industry. Every decade or so there is a major paradigm change in games that produces whole new genres of content. There was a jump from text games to 2D sprite games, a jump from 2D sprite games to 3D, a jump from single-player games to multiplayer, and a jump from multiplayer to massively multiplayer. Video games as a consumer media type are really only about 25 years old. It took over 25 years for video to move from the movie theatres into people's living rooms via television. The game industry we know today is just a toddler that bears almost no resemblance to the mass media form it will ultimately become. Games are already the dominant medium consumed by most young males. Within our lifetimes gaming will grow to become the dominant medium for almost all consumer demographics.

If books are the medium of ideas, radio the medium of sound, and video the medium of imagery, then games are the medium of interactivity. Consumers are increasingly moving away from valuing media for its content and moving to-ward valuing media for its interactivity. Our kids will grow up thinking that passive media you just sit back and listen to or watch is like black-and-white television and phonograph records are to us, antiquated media. Most big media companies don't get this and don't want to accept it, so they continue to invest heavily in the assumption that the same old media we used to enjoy will continue to be really popular in an interactive era. They can't accept that music and video are rapidly losing relevance in an interactive world. Even music and video on the Internet are increasingly being valued for the flexibility with which they can be manipulated and consumed, not for their content.

I think it's very interesting to look at how other media types like television evolved to try to figure out how gaming will evolve. For example, before it was possible to broadcast video over the airwaves into everyone's homes, the only way to get video was to pay a premium to sit in a crowded theater at a scheduled time to watch two to three hours of contiguous, uninterrupted, preauthored video. When television came along, all of that changed because suddenly you could consume video in the comfort of your own home, on demand, in small bursts as it fit your day, free of charge, and supported by advertising. Of course, the content had to change for this to work, as well. It would be absurd to suggest that Coke might have underwritten the $270 million cost of producing "Titanic" the movie for the privilege of putting a Coke machine on the deck of the ship and then trying to charge movie goers a premium to watch it, or more costly still, trying to give the movie away for free. Anybody in traditional media hearing this idea would say, "That's a crazy idea, it's too expensive for Coke and ruins the movie!" Television, on the other hand, works well for advertisers because TV content is formulated in short, light, consumable units designed around advertising sponsorship. Consumers who don't want to see the advertising can pay a premium to buy their favorite shows on DVD season by season. It's too expensive for an advertiser to buy everyone a ticket to a three-hour epic movie like "Titanic," but the collective force of advertising can buy you 25 years of free "Star Trek" episodes on television.

Microsoft recently acquired a company called Massive that promised to make lots of money by injecting advertising into the games consumers buy. In the absence of any historical perspective, this sounded like a pretty exciting idea to a lot of media companies and analysts, who never bothered to ask gamers if they minded having the video games they pay $60 for turned into adware. (FYI, over 65% say that yes, they mind. Big shock.) Consumers understand that advertising supports *free* content; they don't expect to see advertising in the epic content they pay a premium for.

Another false start in figuring out how to get the game business to behave like television is the idea that games should be interrupted with advertising just like TV shows are. Both RealNetworks and Microsoft think this is a brilliant innovation in gaming. This is the sort of idea you get when traditional media guys try to apply their experience with passive media to interactive media. TV and radio are interruptible because viewers and listeners consume the media passively, often while engaged in other activities. Interrupting interactive media inherently destroys its entertainment value, not to mention that interrupting media at all is rapidly losing its effectiveness in an Internet/TiVo world where consumers no longer tolerate interruptions to their media consumption. Media folks never consider the possibility that one of the many reasons that gaming is becoming the dominant media is precisely because of its noninterrupted nature.

A major obstacle for the game industry to make the leap to television-like business models is figuring out what it means to "broadcast" games into people's living rooms. One might naturally assume that this means downloading games off the Internet instead of buying them in boxes. Unfortunately, games have a unique property as a media that makes this much harder than it was for video. Games expand in size exponentially while bandwidth into people's homes grows linearly. One of the costs of being 3D is needing N^3 more content by Alex St. John

to render a world from every point of view possible, not just the one point of view a video camera captures. Consider this: In 1993, when everybody connected to the Internet with 56.6Kbps modems, best-seller Doom fit on a 1.44MB floppy disk. Downloading Doom would have taken the average modem user about 23 hours. Today we all have broadband, or roughly 26 times as much bandwidth running into our homes. Today's best-selling PC game is World of Warcraft, a 6GB game that would take an average consumer five days to download on broadband! Tomorrow's games will fill Blu-ray Discs with 10 times as much content, and if you're really lucky you might have twice the bandwidth at home when they arrive. Thus traditional games are actually becoming *less* downloadable with time, not more downloadable, breathless claims by many folks who are trying to make it work but can't do the math notwithstanding.

The solution that works and that the market is slowly discovering is that new "television-like" content needs to be created for online distribution. These new games, which are often referred to as "casual" games, are small programs designed around simple, highly addictive play mechanics. This content also bears the hallmarks of what the venture capitalists call "Web 2.0" in the form of community-authored features, which people following my television analogy might recognize as being a property of reality TV shows and game shows. The truth is that the video game industry discovered user-authored content in the form of Half-Life mods and custom Quake deathmatch maps long before VCs called posting your own media online "Web 2.0."

The real opportunity for getting your games for free arises neither from advertisers interrupting your games with ads nor injecting adware into the games you pay for, but from advertisers buying your gameplay for you in the form of sponsoring your gaming sessions. If you pay $50 for a premium game that you know you're going to play five times a week for four months, that's 63 cents per session. Advertisers can't afford to buy a whole $50 game for every consumer just as they can't afford to buy everyone's $8 ticket to see "Titanic," but they can afford to sponsor 63 cents' worth of entertainment for you. Thus my prediction is that games will make the jump to becoming the dominant broadcast media through original content specifically designed for online distribution with free sessions of play and in-game currency sponsored by advertisers. Instead of buying whole monolithic games, you'll be able to consume all games in sessions in any proportion you have an appetite for, the same way you can surf television channels freely and consume as much or as little of any show you want. ▲

What I Want For Xmas

I always hate writing my Xmas wish list because I never wait for anything I want, so there's never anything left to wish for by the time Xmas rolls around, except actually having some time to play the games I've been hoarding all year. My list, then, includes the things I really want that aren't easy for anybody to give me.

1. *To lose 100lbs. so my back stops hurting (down 90lbs. so far).*
2. *To have a lot of consumers do their Xmas shopping for games on my Web site.*
3. *One of the ridiculously cool new Voodoo laptops with a 21-inch display that defies time and space to actually fit comfortably in an ordinary laptop case.*
4. *A TiVo that can automatically filter out stupid news commentary.*
5. *To personally wish everybody a Merry Christmas, especially people who are offended by it.*
6. *For the United States and Cuba to reconcile their differences so I don't have to go to Canada for cigars.*
7. *Coal in the stockings of the politicians who thought criminalizing online poker was a good idea.*
8. *For everybody to buy a new PC for Xmas instead of a game console.*
9. *A new editorial staff at* Scientific American.
10. *To enjoy thinking of my fillings as "having bionic teeth" without being laughed at.*

Alex St. John was one of the founding creators of Microsoft's DirectX technology. He is the subject of the book "Renegades Of The Empire" about the creation of DirectX and Chromeffects, an early effort by Microsoft to create a multimedia browser. Today Alex is President and CEO of WildTangent Inc., a technology company devoted to delivering CD-ROM quality entertainment content over the Web.

Tomorrow's games will fill Blu-ray Discs with 10 times as much content, and if you're really lucky you might have twice the bandwidth at home when they arrive

Send your feedback to TheSaint@cpumag.com

DREAM HARDWARE

These Gizmos Don't Sing It, They Bring It

Time for some language lessons in Dream Hardware-land. Electric hybrids rock, *quod erat demonstrandum*. It's time for an intoxicating new wireless node, for *in vino veritas*. Erm, I haven't thunk up anything Latinish to say about the new speakers topping my wish list, but really, they speak for themselves.

by Marty Sems

Provina WinePod

I can't fathom why this hasn't yet made *CPU*'s list of must-have hardware. It's a wireless peripheral that makes wine. Yes, it's for real. Put a load of grapes into the 75-liter WinePod ($1,999; www.mywinepod.com), whether your own pickings or a frozen selection specially chosen by Provina. During the fermentation cycle, you can monitor the process through your browser. The WinePod manages the temperature, pH, and Brix, and even presses the grapes. Co-founder Greg Snell says that Steve Jobs hasn't yet let slip his dogs of litigation on the WinePod's name (the puppies are named Cease and Desist). After all, "the WinePod is actually a pod," Snell says. There's a waiting list, as you can imagine. Meanwhile, I hear that NEC's PaPeRo robot (www.incx.nec.co.jp/robot/english/robotcenter_e.html) has developed a taste for wine. Here's hoping his mornings after aren't plagued with a digital version of the wrath of grapes.

Jamo Reference R 909

What price beauty? What price art? Call it about 15 grand for a pair of Jamo Reference R 909s (www.jamo.com). Like one of those skeletal violins, the 909 doesn't need a resonance chamber to make startling cascades of sound. The dipole loudspeaker uses dual 15-inch, electrodynamic woofers for the punchiest bass. A laminated baffle helps the 909 stay out of the way without adding its own flavor to the sound of the original signal. Choose a set of 909s with a splash of color, and watch the masterful become a masterpiece right in your listening room.

PML FlightLink MINI QED

Another month, another electric hybrid supercar. How about a Mini Cooper with more than 640bhp? All-wheel drive? And no brakes? OK, no *mechanical* brakes, but you'll still stop in a hurry when each tire's electric motor reclaims all that rolling energy. This demo vehicle made by the Brits at PML (www.pmlflightlink.com) boasts a 4.5-second 0 to 60mph time (thanks to special capacitors), a 150mph top speed, traction control, phenomenal energy management, and 80mpg mileage. Looking wilder but driving milder is the C-Metisse (www.citroen.com). This grocery-getter concept from Citroen is actually a diesel hybrid, but electric motors in its rear wheels kick in for automatic all-wheel drive. The funky part is the way all four doors open vertically. Mike Brady would need to update his Astroturf lawn before bringing this 21st-century wagon home to the Bunch. ▲

VANTEC

Your computer system is only as fast as your slowest component. With the advent of Serial ATA 3Gbp/s hard drives, storage device is finally catching up with your multi-core CPUs. Vantec will take you to the next generation of peripheral connection. With special designed connector and cable, eSATA cable gives reliable tranmission in a blazing speed that's 5x faster than 480mbps USB! This big pipe will revolutionize external storage and enable you to back up your data at least twice as fast.

STORE n SHARE

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for more information on where to buy please go to
http://www.vantecusa.com/wheretobuy.html

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The Ears Have It

A Trio Of Musicphone Headsets Compared

Nothing says "n00b!" on an incoming call quite like clumsily pulling out one of your iPod's earbuds to make way for your cell phone, only to miss the call anyway because you didn't hear your phone until the fourth ring. Smooth. Want to simplify and improve audio quality in the process? Start by getting a musicphone and headset that effortlessly switches been music and voice calls. We grabbed a Motorola Q to check these three contenders.

BT620s

If you don't mind looking like Lando Calrissian's assistant in "The Empire Strike's Back," Jabra's BT620s is a behind-the-head, stereo Bluetooth marvel. Controls on the left headphone adjust the volume, send and end calls, redial, and activate voice dialing. The right headphone contains the BT620s's music playback buttons. This headset is more comfortable for its size and weight than I expected, but it does fully cover the ears (check your state's driver laws about potential safety laws regarding this) and tends to feel hot after extended use.

The BT620s pauses the music whenever you switch to phone functionality. Its sound quality is superb in both mono and stereo, and outbound voice quality proved surprisingly good for a boomless design. For those with a Bluetooth dongle, the BT620s can double as your PC's headset. The trick is to make sure that your phone and/or dongle support Bluetooth's still-rare A2DP (Advanced Audio Distribution Profile) for stereo playback. Note that you can disable the glowing blue LEDs—highly advised for when you're not entering a John Hollis look-alike contest.

MX203S-X1S

Decidedly comfortable, this set of Plantronics earbuds posing as clip-on earrings. Although once in place, you soon forget your fashion faux pas and enjoy some respectably good stereo playback. Plus, the ear lobe clips keep the speakers firmly in the ear canals, so the MX203S-X1S sounds better than most earbuds suffering from an improper fit.

Plantronics uses a wind screen on the microphone that virtually eliminates the loud, fluttering whoosh you usually hear on most headset mics when you breathe on them or expose them to any wind. The send/end button is built into one of the earphones, making it easier to find in a hurry.

Sound quality is expectedly fair, given the sub-$35 price, but we had no problem with music automatically pausing for incoming calls. For those without Bluetooth, this is a decent step up from junk buds for any phone with a 2.5mm audio jack and call answer/end support.

MM50

The Sennheiser MM50 is a lightweight, in-the-ear headset with stunning sound quality (18 to 22,000Hz). I was ready to fall over for this set. The mids and highs are reasonably strong and clear, and it has very good bass that makes listening to music a very enjoyable experience.

After prolonged use, though, I found the pressure from the ear sleeves a bit uncomfortable. Cell phone control runs through the send/end button on the inline microphone that dangles under your chin. This takes some getting used to. The MM50 requires a musicphone with a 2.5mm, 4-pole headset jack. The set blocks a lot of external noise and delivers excellent audio if you don't mind a little wind noise. ▲

by Billy Ristle

MM50
$59.95
Sennheiser
www.sennheiserusa.com
●●●

Specs: Carry bag; direct connect to Sony-Ericsson and Samsung phones; three ear sleeves (small, medium, large)

BT620s
$129.95
Jabra
www.jabra.com
●●●◖

Specs: Talk time: 16 hours; Music streaming time: 14 hours; Bluetooth 1.2 with A2DP and AVRCP (Audio/Video Remote Control Profile)

MX203S-X1S
$34.95
Plantronics
www.plantronics.com
●●◖

Specs: WindSmart microphone; Flex Grip design; 2.5mm audio jack; one-touch call answer/end

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

All The Better To See You With

These Aren't Your Garden-Variety Web Cams

Whether you need to keep an eye on your desk, the baby, the babysitter, your driveway, the warehouse, or just run a live feed for the world to enjoy, IP-based network cameras are what you want. Unlike USB-based Web cams, network cameras contain an integrated Web server. Simply connect the device to a router and configure it; you can tap into and control the camera from anywhere—a nearby desk or a different continent—watching and recording what the camera sees in real-time.

We took a look at eight network cameras with diverse pricing and features . All eight models can serve as security systems triggered by different stimuli, such as in-image motion or an external alarm. Most models feature the ability to email a JPEG screen capture to one or more email accounts in the event of an alarm trigger. In some instances, browser-enabled cellular phones can display images or let you control the camera, a handy bonus for when there's no nearby PC.

Another key feature is compatibility with free DDNS (dynamic DNS) services, which map Internet domain names to a given IP address. Some camera vendors want you to subscribe to their own DDNS services for a fee, which strikes us as unnecessary and greedy. Other minor features include the ability to monitor multiple cameras with the same program, camera movement scheduling, two-way audio via integrated speaker and mic or accessory jacks, and built-in motion detection. (Some cameras use an external program for motion detection; others, their internal servers.)

Two other potential features bear special attention: external I/O and PoE (Power over Ethernet) support. External I/O ports interface with accessory devices that can trigger recording or other events. For example, a separate motion detector could monitor a location leading up to an IP camera and trigger recording before the subject enters the area. Power over Ethernet carries the device's power along with data over Ethernet cabling, a useful way to eliminate AC power lines.

In addition to getting a feel for each camera's feature range, usability, and overall value to a higher-end consumer, we principally (and subjectively) tested for three things: image quality; the performance balance between quality, frame rate, and resolution; and low-light effectiveness. We tested the cameras' motion capture at various frame rates and image sizes by recording walking people and waving hands—not terribly rigorous but still practical. Lastly, we examined footage from a range of low-light, indoor conditions.

WVC54GC

The Linksys Compact Wireless-G Internet Video Camera is affordable, but it still has 802.11b/g support, 10/100 Ethernet, and security services all in a slim, disc-shaped device perched on a tilt-enabled desk stand. With the exception of the camera not using DHCP by default (you must use Linksys' bundled camera finder program and enable DHCP in the settings), configuration is simple.

Configuring, viewing, and capturing images are all browser-based, while advanced features are accessible via the Camera Viewer Recorder Utility. This is a drawback, because any remote computer you want to access the camera from requires you to install this software locally in order to do things such as record from the camera or use motion detection functions. That said, the motion detection is sophisticated enough to let users select specific areas of the screen for monitoring. Just highlight the pixels containing an object or area to monitor and set the desired level of sensitivity. The program will then capture video when triggered by motion of that object or within that area.

We found the WVC54GC's image quality sub-average for this roundup. You can see that people are in an area, but detailed features are too indistinct to identify an unfamiliar face. Image quality also drops off very quickly as light levels dim below full indoor illumination. However, color is more vibrant than expected, probably because of post-processing in the camera, and frame rate performance is similar to or better than some of the more expensive cameras.

WVC54GC
$119.99
Linksys
www.linksys.com
●●

This camera is versatile because of its small size and wireless capabilities, but is a poor surveillance option, owing to its QVGA resolution (unless your goal is to see that there's no activity in the field of view). Note that DDNS functionality only works through Linksys' SoloLink service, and only a free trial is included.

HNC290G

Hawking's HNC290G Net-Vision Wireless-G Network Camera stands up against Linksys' unit in the budget category, sporting similar 10/100 Ethernet and 802.11b/g connectivity but adding adjustable tilt on the lens. The external antenna is removable for those who want a high-gain substitute. Hawking promotes this as the first network camera with automatic router configuration, but this function didn't work on our D-Link DIR-635 router, forcing us to perform a manual installation.

Hawking requires remote service via the TZO DNS service, which has only a 75-day free trial. Another weakness is that

HNC290G
$129
Hawking
www.hawkingtech.com
●●◖

motion sensing sensitivity isn't adjustable. Also, some configurations require Hawking's bundled camera viewing software, meaning you can't change certain settings with the HNC290G's internal Web server via a browser.

The HNC290G's image quality on this device is fair, showing greater detail than the Linksys camera but lacking its color depth. Many test scenes look darker than they should, and you'd be hard pressed to identify an unknown visitor at normal range. The camera showed sharper motion results than expected in lower resolutions, but the 10fps rate in VGA mode is a known limitation—don't expect miracles. In low light, the HNC290G did well for its price and even triggered into recording upon motion detection, although the image quality was very poor. Again, this camera would be a better choice for casually monitoring a well-lit area than for reliable surveillance.

DCS-1110

Built like a half-pound brick with a camera peeking over its edge, the D-Link DCS-1110 really delivers on features and performance. PoE, a desk stand, and two mounting holes make this unit more versatile for placement than one might suspect. The DCS-1110 integrates one-way audio for recording and a powerful Nightshot mode that uses the full 0.5-lux sensitivity of the image sensor. You can monitor up to three different zones within the field of view, each with its own percentage of sensitivity. The DCS-1110 even lets you preview the amount of motion it detects in each area so you can set a more realistic threshold.

D-Link keeps this camera easy to use without sacrificing flexibility or quality.

DCS-1110
$249.99
D-Link
www.dlink.com
●●●◖

The DCS-1110's setup software displays D-Link's usual simplicity, and its only awkward requirement is that it requires you to install ffdshow (an open-source DirectShow and VFW codec) to play back the MPEG-4 recordings, which, by the way, can spool straight to a NAS box. There are no proprietary DDNS service issues, you can manually adjust the lens focus, and we like D-Link's thoughtful touches, such as an antiflickering mode when used under fluorescent lights and the ability to set bit rate along with resolution.

For the price, D-Link does extremely well at preserving shadow detail and not showing blockiness. The Nightshot mode maintains impressive video down to surprisingly low light levels, and despite showing a noticeable delay between real time and what it displays on your screen, the DCS-1110 shows comparatively little blurring when shooting at VGA in 30fps mode. For those needing a general purpose IP cam on a budget—especially for businesses looking to deploy a bunch of PoE cams around a facility—this is your winner.

DCS-3420

The DCS-3420 takes the usability attributes of the DCS-1110 and piles plenty of extra functionality on top, starting with 802.11b/g (WEP and WPA security included), moving from support for four cameras to up to 16, and accommodating interchangeable lenses (chief among them the optional infrared unit for shooting in total darkness). We didn't receive the IR or auto iris lenses for testing, and our unit seemed biased by default for shooting in low light as images were very over-exposed (see online sidebar "The Eye Of The Beholder").

However, altering the video settings for optimal balance between bit rate, frame rate, and quality and tweaking the image settings (brightness, hue, etc.) yielded substantially better results. Even with the stock lens, though, low-light video proved remarkably clear.

D-Link integrates a BNC video output for connecting to a standard monitor or CCTV system. Another cool feature unique to this camera is the 4X digital zoom capability, which can operate like a mouse-controlled magnifying glass zooming in on a portion of the full frame. Other hot bonuses include two-way audio with the built-in microphone, a removable 802.11b/g antenna, email/FTP of video snapshots, and AVI export.

DCS-3420
$699.99
D-Link
www.dlink.com
●●●

Motion tracking in 320 x 240 resolution mode was excellent, with very little noticeable blur or frame drop even over a wireless connection. The 10fps inherent at top resolution (704 x 480), however, shows a clear trade-off between detail and motion capability; you get one or the other, but not both. On the plus side, this unit's MJPEG and MPEG-4 footage is viewable in any browser without a special application. Given its quality, rugged design, and flexibility for various lighting conditions, we highly recommend this as an upper-midrange security camera.

KX-HCM110

The Panasonic KX-HCM110A is one of the more affordable pan-and-tilt cameras on

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

KX-HCM110A
$349.95
Panasonic
●●●

the market. It offers a substantial 173-degree pan and 105-degree tilt range to monitor a much larger area than fixed lens cameras. Though it's missing optical zoom, the camera's 10X digital magnification (still with scroll wheel control) adds to its flexibility. Dual-stack support for IPv4 and IPv6 may appeal to future-proofing fans, and IPsec support (the same technology used in many VPN connections) eliminates nearly any chance of a hacker viewing your video. Panasonic also included an integrated microphone and a jack for speaker output.

Additionally, the KX-HCM110 features an I/O port so that, for example, when motion or a door sensor triggers an alarm, an external light might be switched on to assist recording. The camera can remember up to eight preset location and zoom combinations for quickly "patrolling" common areas in its field of view. Other basic extras, such as cell phone compatibility, configurable motion detection, and FTP, round out Panasonic's midrange offering.

The picture quality on this camera fit well with the other lower-midrange cameras. Daylight results were noticably below the KX-HCM280A, but our low-light tests were suprisingly good (but still not on level with our higher-end cameras). Strangely, this unit does not support multiple cameras in the viewer application, and VGA mode still holds you to a 12fps limit. So although this is a solid choice for wide-area general monitoring, we wouldn't count on it for surveillance image precision.

IK-WB15A

Wow. The IK-WB15A impresses to the hilt with its sterling image quality powered by a 630,000-pixel CCD—twice the count of most competitors. This enables a maximum resolution of 1,280 x 960 (SXVGA), which it can stream at 7.5fps. Its regular VGA reaches 30fps, making it one of only two cameras to hit this sweet spot. Even though Toshiba only delivers 2.6X optical zoom, you still get very clear close-ups, and the camera's backlight compensation, white balance, and other image controls are among the best we've experienced.

You can auto-patrol or remotely control the pan (112 degrees) and tilt (54 degrees) functionality, and, like the Panasonic models, zoom with your scroll wheel. Toshiba accepts SD flash memory cards as a backup method in case of network failure, or you can simply copy stills and clips to cards for easy transport. The IK-WB15A is weatherized for outdoor use but still suitable for mounting on an inside wall. One external trigger input gives additional flexibility when devising your security setup.

IK-WB15A
$599.99
Toshiba
www.toshiba.com
●●●●

There are only a few drawbacks. The two-way audio is purely external, which can be tricky in an outdoor arrangement. There's no wireless support, and we wonder if top resolution speeds might have improved over Gigabit connection. An IR option would have been good, but Toshiba's quality remains impressive in very low light, all the way down to 0.18 lux (4fps), in part because it switches from color to black and white—a smart choice given how low light usually mangles a camera's color reproduction.

Liberal DDNS, alert emailing, full browser-based control and monitoring, and a very aggressive price all conspire with the above observations to make this our network camera roundup favorite.

KX-HCM280A

Boasting a massive 21X optical zoom, 350-degree pan, and 210-degree tilt, Panasonic's KX-HCM280A is the little Samson of security. At 21X, you can focus clearly on a person's nose from 20 feet away. (But, as we found, whether you can maintain focus on it in moderate light is a different issue.) A mouse or browser-based directional controls dictates all of the camera's movements. The KX-HCM280A can patrol up to eight preset positions, and the included hardware lets you mount it on your ceiling or desktop—simply flip the image orientation in the device settings.

External I/O, cell phone access, and all the other nifty perks from Panasonic's lower-end models remain here. The internal buffer can stash up to 125 frames, then email or FTP them. Drawbacks include lack of wireless connectivity and a maximum of 12fps at VGA resolution. This reliance on 320 x 240 video for acceptable full motion seems inexcusable when compared to Toshiba's camera.

At QVGA and 30fps, the camera looks excellent, with crisp edges, clear detail, and accurate color. The low light resolution down to 3 lux was not as good as some of the other cameras, but Panasonic's Color Night View (0.09 lux) rivals daylight images from some cameras, provided you have no concern for frame rates.

KX-HCM280A
$1,299.95
Panasonic
●●●◖

In sum, this is a fantastic surveillance camera. It's loaded with configuration options and possesses some dynamite optics that compensate for its shortcomings. ▲

by Billy Ristle

For bonus image comparison,
see "The Eye Of The Beholder" sidebar at
www.cpumag.com/cpudec06/eye

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

By The Numbers

	Linksys WVC54GC	Hawking HNC290G	D-Link DCS-1110
CPU Rating	●●	●●◖	●●●◖
MSRP	$119.99	$129	$249.99
Image Quality Ranking*	8	7	4
Motion Ranking*	2	3	2
Low Light Ranking*	8	6	3
Server Features			
Image Compression	JPEG	JPEG	JPEG
Video Streaming Format	MPEG-4	MJPEG	MPEG-4
Quality Video Resolution	320 x 240,160 x 120	640 x 480, 320 x 240,160 x 120	640 x 480, 320 x 240,160 x 120
Frame Rate	Max 24fps (320 x 240) Max 30fps (160 x 120)	Max 10fps (640x 480) Max 30fps (320 x 240) Max 30fps (160 x 120)	Max 30fps (640x 480) Max 30fps (320 x 240) Max 30fps (160 x 120)
Simultaneous Viewers	4	4	8
Image Buffer	No	No	No
Image Transfer via E-Mail	Yes	Yes	Yes
Camera Recording	Local network hard drive	Local network hard drive	Local network dard drive
Free DDNS Compatible	No	No	Yes
Cellular Phone Compatibility	No	No	No
Multiple Camera Views	Yes (External SW)	Yes (External SW)	Yes (External SW)
Time & Day Access Control	No	No	No
Camera Features			
Zoom	2X digital	2X digital	4X Digital
Image Sensor	CMOS	1/4-inch 300,000 pixel CMOS	1/4-inch 300,000 pixel CMOS
Remote Pan Angle	N/A	N/A	Digital
Remote Tilt Angle	N/A	N/A	N/A
Click To Center	N/A	N/A	N/A
Focus	Fixed 3mm to infinity	Manual adjust	Manual adjust
Illumination	5.1 lux relative	Not Published	0.5 lux
Audio Features			
2-Way Audio	No	No	Record Only
Input	N/A	N/A	Built-In
Output	N/A	N/A	N/A
Wireless Features			
Wireless Technology	802.11b/g	802.11b/g	None
Antenna	Internal	External	N/A
Interface Features			
External I/O	None	None	None
Network Connection	Ethernet (10Base-T/100Base-X)	Ethernet (10Base-T/100Base-X)	Ethernet (10Base-T/100Base-X)
Analog Video Output	None	None	None
Spreaker / Microphone Jack	N/A	N/A	N/A
Other Features			
Weather Proof	No	No	No
Built In Motion Detection	Yes	Yes	Yes
Power Over Ethernet Capable	No	No	Yes
Mounting Options	Wall, desk, tripod	Wall, Desk, ceiling, tripod	Wall, desk, ceiling, tripod
Power Consumption	8W	6W	8.5W
Dimensions (HxWxD, in inches)	4.02 x 3.54 x 1.46	1.25 x 5.5 x 5	1.77 x 2.99 x 5.46
Weight	0.29 lbs	2 lbs	0.44 lbs

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

*A "1" indicates top performance in the given category.

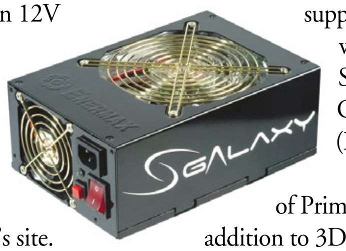
D-Link DCS-3420	Panasonic KX-HCM110A	Toshiba IK-WB15A	Panasonic KX-HCM280A
●●●	●●●	●●●●	●●●◖
$699.99	$349.95	$599.99	$1,299.95
3	5	2	1
2	2	1	1
1	4	2	5
JPEG	JPEG	JPEG	JPEG
MPEG-4, Motion JPEG	MJPEG	MJPEG	MJPEG
704 x 480, 352 x 240, 176 x 120	640 x 480, 320 x 240,160 x 120	1280 x 960, 640 x 480, 320 x 240,160 x 120	640 x 480, 320 x 240,160 x 120
Max 10fps (704 x 480) Max 30fps (352 x 240) Max 30fps (176 x 120)	Max 7.5fps (1280x 960) Max 12fps (640x 480) Max 30fps (320 x 240) Max 30fps (160 x 120)	Max 30fps (640x 480) Max 30fps (320 x 240) Max 30fps (160 x 120)	Max 12fps (640x 480) Max 30fps (320 x 240) Max 30fps (160 x 120)
8	30	10	30
No	125 frames (320 x 240)	Yes via SD memory slot	125 frames (320 x 240)
Yes	Yes	Yes	Yes
FTP, Local network hard drive	FTP, Local network hard drive	Local network hard drive	FTP, Local network hard drive
Yes	Yes	Yes	Yes
No	View and control	No	View and control
Yes	No	Yes	Yes
No	Yes	No	Yes
4X digital	10X digital	2.6X Optical	21X Optical, 2X digital
1/3-inch CCD	1/4-inch 320,000 pixel CMOS	1/4-inch 629,856 pixcel CCD	1/4-inch 320,000 pixel CMOS
Digital	60 degrees	112 degrees	350 degrees
Digital	110 degrees	54 degrees	210 degrees
N/A	Yes	Yes	Yes
Manual adjust	Fixed 1m to infinity	1.0 m to infinity	Auto / Manual
0.5 lux	1 lux	0.5 lux	3/0.09 lux
Yes	Yes	Yes	No
Built-in	Built-in / External	External	N/A
External	External	External	N/A
802.11 b/g	None	None	None
External	N/A	N/A	N/A
1 in / 1 out	2 in / 1 out	1 in / 1 out	1 in / 1 out
Ethernet (10Base-T/100Base-X)	Ethernet (10Base-T/100Base-X)	Ethernet (10Base-T/100Base-X)	Ethernet (10Base-T/100Base-X)
BNC	None	None	Composite
3.5mm mini-jack	3.5mm mini-jack	3.5mm mini-jack	N/A
No	No	Yes	No
Yes	Yes	Yes	Yes
No	Yes	Yes	No
Wall, desk, ceiling, tripod	Wall, desk, ceiling, tripod	Wall	Wall, desk, ceiling, tripod
8W	6W	10W	4.6W
2.4 x 3.2 x 6.7	3.94 x 3.94 x 2.98	5 x 5 x 4.33	4.48 x 5.51 x 4.48
1.2 lbs	0.66 lbs	1.44 lbs	1.41 lbs

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Enermax Galaxy EGA1000EWL

Although some enthusiasts' tastes are turning toward fewer 12V rails in high-end power supplies, Enermax endowed this 1kW Galaxy with five 12V (17A) rails. Two rails are for the CPU(s) and three are for graphics cards and other components. The PSU is CrossFire Certified for X1950 cards, but it doesn't have an SLI-Ready badge. Still, Quad SLI gave it no trouble in my tests.

Call it the best of both worlds or a compromise that dissatisfies everyone equally: The EGA1000EWL sports a bevy of native cables without resistance-adding modular connectors, yet it comes with modular cables so you can add what you need. Beyond the usual are four PCI Express connectors, 8-pin and 4+4-pin 12V CPU plugs, and an additional 4-pin 12V cable for full-on quad-CPU systems with 32GB or 64GB RAM. Simply put, this Galaxy comes with all the connectors recent and near-future PCs will need; there's a full list on Enermax's site.



To stress-test this monster, I used a quad-CPU, quad-GPU, quad-HDD system that drew about 255W idle and a maximum of 420W, according to an Extech 380803 power analyzer. The PC had a 2.66GHz, 130W TDP Core 2 Extreme QX6700; an Intel D975XBX2 motherboard; 2GB 1,066MHz Corsair DDR2; and dual EVGA e-GeForce 7950 GX2s in Quad SLI mode. (Windows XP and ForceWare 91.47 both detected and allowed Quad SLI, but Nvidia will determine official driver support.) Oddly, this PSU wouldn't work on a Sapphire PC-AM2RD580 Crossfire Xpress 3200 (RD580) mobo.

I ran separate instances of Prime95 on all four cores in addition to 3DMark06 at 4XAA/16XAF and 2,048 x 1,536 resolution. Performance was flawless throughout three hours of looped tests at a steady 38 degrees Celsius (100 F) case temperature. The company claims "24/7 full power at 50 C" (122 F). I see no reason to doubt it. ▲

by Marty Sems

Rated Watts	Rated Peak	+12V	+5V	+3.3V		+12V	+5V
1kW	1.1kW	17A (x5)	30A	30A	**Idle**	12.13 - 12.19	5.03 - 5.05
					Loaded	12.13 - 12.19	5.03

Specs: CrossFire Certified; 4 PCI-E connectors; active PFC; 2007 EPS12V; 135mm and 80mm fans; 80 to 85% efficiency

Galaxy EGA1000EWL
$335 and up (online)
Enermax
www.enermaxusa.com
●●●●◖

Caldigit S2VR Duo

Caldigit's S2VR Duo, which is available in capacities between 500GB and 1.5TB, is an external SATA RAID device whose claim to fame is support for 10-bit, uncompressed HD video capture and playback. To achieve the high performance necessary for this capability, the unit relies on e-SATA connectivity and its pair of fast 3Gbps SATA hard drives.

The S2VR Duo has a custom aluminum enclosure, which resembles Apple's Macintosh G5 case. The kit includes two hard drives in removable tray modules, an e-SATA cable, a quick installation guide, a driver CD with digital manual, and an external power supply. An optional e-SATA host adapter is available, as well, in either PCI-X or PCI Express flavors. A wire mesh at the front of the unit vents air, which helps keep the internals cool, and the rear is equipped with power and reset switches, power and e-SATA connectors, and a selector switch that lets you configure the array in Protected, Performance, Concatenated, or JBOD modes.

The unit I tested included 7,200rpm, 250GB Seagate Barracuda ES hard drives and was coupled to Caldigit's PCI-E FASTA-4e card (sold separately or as a bundle with the S2VR Duo), which uses a Silicon Image SiI 3124 controller. When I configured the SVR2 Duo in Performance mode (RAID 0), the 500GB unit's total formatted capacity was 465GB. But keep in mind that you'll halve its capacity in Protected mode (RAID 1).

With the unit configured for high performance, HD Tach v3 reported 107.8MBps average read speeds, 2% CPU utilization, and a burst rate of about 129MBps. I also tested the S2VR Duo without the FASTA-4e card using the SiI 3132-based e-SATA port integrated into an Asus A8N32-SLI motherboard, and it

managed a 101.9MBps average read speed, 2% CPU utilization, and a burst rate of about 120MBps.

With a price tag over $500, the S2VR Duo won't have mass market appeal, but for users who need a large-capacity, high-performance, external storage device, the S2VR Duo would be a fine choice. ▲

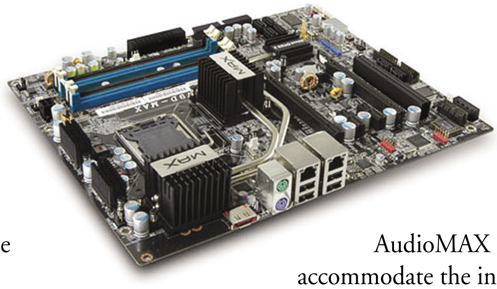
by Marco Chiappetta

Specs: Capacity: 500GB to 1.5TB; Interface: e-SATA; Power: Input 100-240V auto switch, 50~64Hz 1.5A, Output 5V 4.2A, 12V 3A

S2VR Duo
$549
Caldigit
www.caldigit.com
●●●●

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

Abit AW9D-MAX



Abit has a new 975X Express-based motherboard in its arsenal, the AW9D-MAX, to compliment Intel's recently released Core 2 family of processors. One look at the board and its list of specifications reveals that the AW9D-MAX is clearly targeted at enthusiasts and overclockers, but a couple of shortcomings prevent it from being truly great.

First, the good. A custom heatsink and heatpipe apparatus passively cools all of the AW9D-MAX's major components, keeping the VRM, northbridge, and southbridge temperatures under control without generating any noise. The board also has an overclocker-friendly BIOS that's chock full of voltage and frequency options. It fully supports CrossFire, and its dark-colored PCB with black and blue connectors and LEDs on the underside give the AW9D-MAX a menacing look.

Best of all, the board is also an excellent performer. During my testing, the AW9D-MAX, coupled with a Core 2 Extreme X6800 processor, completed the Cinebench multithreaded rendering benchmark in just 28.2 seconds, and it put up 279fps in a low-res F.E.A.R. benchmark run.

It's not all good, though. The AW9D-MAX's slot configuration is a major shortcoming. The board is outfitted with two PEG slots, two PCI Express x1 slots, a single PCI slot, and one proprietary AudioMAX slot to accommodate the included 7.1-channel audio riser card. Install a pair of double-wide graphics cards, though, and you'll sacrifice the PCI slot and one of the x1 slots, which leaves minimal expansion possibilities. The I/O backplane is also legacy-free with no serial or parallel ports (which is fine in my book), but instead of using the extra real estate for more USB or FireWire ports, Abit simply left the available areas blank. ▲

by Marco Chiappetta

Specs: Socket LGA775; Intel 975X; Max memory: 8GB DDR2-800/667; I/O: 7 SATA 3Gbps, 1 e-SATA, 2 IEEE 1394, 1 Floppy, 1 IDE; Audio: 7.1 CH HD AudioMAX; Dual Gigabit Ethernet; Multi-GPU support: ATI CrossFire; Slots: 2 PCI-E x16, 2 PCI-E x1, 1 PCI, 1 AudioMAX

AW9D-MAX
$239
Abit
www.abit-usa.com
●●●

Plextor PX-608U

You can never be too thin or too versatile. That's the goal of Plextor's Super Multi Portable DVD drive, the PX-608U, and it succeeds admirably. This paperback-sized drive barely tips the scales at a pound. It can read and write the usual suspects (CD-R/RW, DVD±R/RW), plus 9.4GB dual-layer discs. Best of all, it can write DVD-RAM discs, which can hold up to 9.4GB and let you rewrite them up to 100 times more than RW—the perfect medium for big, on-the-fly backups.

Installation's a breeze. Connect the supplied USB cable to a USB 1.1 or 2.0 port (but not, alas, to a USB hub), plug in the AC adapter (that's right, it's not bus-powered), and it's ready to roll. One big plus: Unlike internal DVD-RAM drives, this one can work with older systems—even 450MHz Pentium III PCs. The drive will happily read about any kind of CD or DVD you stick into it.

Performance is a mixed bag. Plextor vaguely claims that the drive can burn 4.7GB to DVD+R disc in six minutes (13MBps), but I never achieved speeds anywhere near this. In my tests, the drive burned CDs and DVDs at speeds ranging from 1.2 to 5.3MBps, with DVD movie burning maxing out at 3.4MBps—performance comparable to some internal DVD burners.

And keep in mind that this baby is fragile. The unit can only take up to 2G operating shock, the drive tray is especially delicate, and there's no hard-shell carrying case. Opening the disc tray is problematic because the eject button is on the tray itself, nor does the tray fully extend when you eject a disc.

But these are quibbles. This is the smallest, slimmest DVD-RAM drive on the market. The combination of solid performance, versatility, compatibility, a competitive price, and a one-year warranty (with unlimited toll-free technical support) makes this a steal for real. ▲

by Robert Luhn

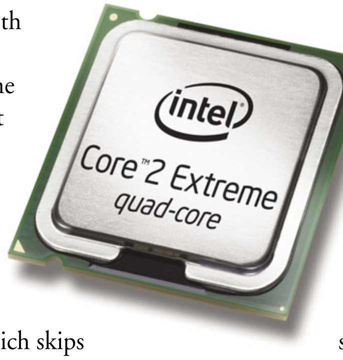
Specs: Speeds: 24X CD-R, 8X DVD±R, 8X DVD+RW, 6X DVD-RW, 4X DVD±R DL, 5X DVD-RAM; 2MB buffer; Buffer Underrun Proof technology

PX-608U
$199
Plextor
www.plextor.com
●●●●

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Intel Core 2 Extreme QX6700

After losing some ground to a tenacious chipmaker that produced a string of solid CPUs, Intel redeemed itself in the eyes of its fanboys and more than a few critics with the high-powered Core 2 series. The Core 2 Extreme X6800 offered the highest CPU performance and garnered plenty of praise from reviewers. Hot on the heels of this success comes the Intel Core 2 Extreme QX6700 (Kentsfield), which skips a faster clock speed in favor of additional cores: The QX6700 boasts four cores.



Both the X6800 and the QX6700 have unlocked multipliers and a 1,066MHz FSB. That said, the processors have several differences (aside from the obvious difference in their respective number of cores).

For one thing, at 8MB, the QX6700's L2 cache is twice the size of the X6800's. The chip dynamically allocates the two 4MB chunks to cores based on the workloads each core is carrying. Kentsfield also has a multiplier of 10 compared to Conroe's 11, so the 2.66GHz QX6700 lags behind the 2.93GHz X6800 in sheer clock speed.

Although I didn't have time to thoroughly overclock the QX6700 before going to print, the processor's default scores are impressive. I tested the processor on an Intel D975XBX2 motherboard, which sports the Intel 975X Express chipset. The board itself features Gigabit Ethernet, support for up to 8GB DDR2-667 memory, and RAID 0, 1, 5, or 10.

The system produced eye-catching numbers right off the bat, with a 3DMark06 score of 8924 (the CPU score was 3871) and 7681 in PCMark05 (the CPU score in that test was a whopping 8444). It handled my Dr. DivX and WinRAR tests well but really shined in the two Futuremark tests. This is a processor worth keeping an eye on; we'll take a closer look at the QX6700 on a board that features Nvidia's new nForce 600i chipset next issue. ▲

by Joshua Gulick

Specs: 2.66GHz clock speed; 1,066MHz FSB; 65nm manufacturing process, 8MB L2 cache (2x 4MB, dynamically allocated)

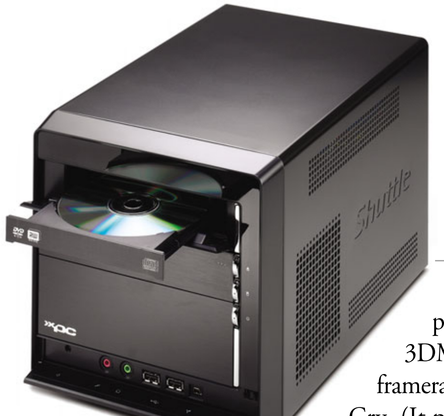
Core 2 Extreme QX6700
$999
Intel
www.intel.com
First Look Preview

Shuttle XPC P2 3700

Shuttle's P2 Series sits atop the gaming XPC line. The P2 systems aren't the smallest XPC rigs, but they pack the biggest performance punches while remaining extremely portable.

The P2 3700's default specs don't look bad (a 2.13GHz Intel Core 2 Duo E6400, 2GB RAM, and an ATI Radeon X1900 GT), but the system can also handle the very latest components without sacrificing its big selling points, such as silent operation and portability.

To prove this point, Shuttle loaded up my review unit with some of the best parts you'll find in its online XPC configuration site—a 2.93GHz Intel Core 2 Extreme X6800, 2GB Crucial Ballistix PC2-5300 DDR2-667 memory, and a BFG GeForce 7950 GX2. The video card uses one of the two PCI Express x16 slots and covers both PCI-E bays, reducing the P2 3700's expandability.



XPC P2 3700
$3,273
Shuttle
www.shuttle.com
●●●●

That's not to say the P2 3700 doesn't have any room for extras; mobo connectors and an external 3.5-inch bay under the optical drive let you add another IDE or SATA hard drive, for example. You'll find the power connectors you need tucked up above the PSU.

I doubt you'll need an extra drive for awhile, though. The system's two drives offer plenty of storage as it is: A 150GB Western Digital Raptor 10,000rpm drive houses the OS and a 400GB Seagate Barracuda provides ample storage for your favorite games.

Not surprisingly, the GX2 gives the system some real gaming muscle. The system posted 8492 in 3DMark06 and offered a framerate of 162.77 in Far Cry. (It posted 100fps in F.E.A.R.) The P2 3700 also provided decent scores in my Dr. DivX and WinRAR tests with 3:12 and 4:36 (minutes:seconds), respectively.

The XPC P2 3700 is a solid little machine. Although it lacks the sort of expandability you'll find in larger systems, it clearly has the graphics power to hold its own at the next LAN party. ▲

by Joshua Gulick

For extra benchmark scores, see our chart at www.cpumag.com/cpu/dec06/xpc

Specs: 2.93GHz Intel Core 2 Extreme X6800, Intel i975X/ICH7-R, Gigabit LAN, PN18 802.11b/g Wireless LAN Kit, Windows XP MCE

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Ergodex DX1

The Ergodex DX1 isn't brand new, but it recently joined Dell's lineup, bolstering Dell's selection of gaming pads. Unlike other gaming pads, which have stationary keys that support custom key assignments, the DX1 has movable keys. That's right—you can put the keys in any formation on the DX1's pad.

On the macro-and-key recording front, the pad is versatile. The included Ergodex Manager software lets you record single keystrokes, blocks of text, and application-launch commands. Thanks to a profile system, a single key can support multiple macros. For example, the key might trigger your weapon in an FPS, and release a signature when you're writing an email. The software also includes a Global Profile that isn't application-specific.

Real-time macro-assignment buttons, which sit in the upper-right corner of the pad, are a boon for gamers. If you realize that you need a macro but don't want to leave the game, simply press the button and record the macro. The application profile automatically updates your new macro. The software also lets you use any image to print a background that sits between the pad and the pad's clear tray. The background can also display markers that let you put your keys in the appropriate locations.

Each individual key has a sticky base that secures it to the pad's tray. It's a solid grip. I never moved a key out of place, even when I pushed the sides of the keys. That said, removing the key requires only a quick twist. I replaced keys dozens of time without reducing their stickiness. That's important, because I found that my ideal key layout changed dramatically, but slowly.

Despite the heavy price tag, I like the DX1. Its unique design lets you customize the keys to an extent that other pads can't, and the Ergodex Manager is easy-to-use. However, Ergodex wouldn't tell me when or even if a Vista driver might be available, so I can't recommend this device to anyone who is planning to upgrade to the forthcoming OS in the near future. ▲

by Joshua Gulick

DX1
$149.95
Ergodex
www.ergodex.com
●●●

Specs: Single key tray; 25 movable keys; key labels; Ergodex Manager software

Asus GeForce EN7900GS TOP/2DHT/256M

Asus includes "TOP" in the model branding of its factory-overclocked graphics cards to signify "top of the heap" performance vs. competitive cards or the standard fare in the Asus lineup. Although Asus TOP series models typically cost more than standard offerings, these babies often push the limits even further in terms of clock speeds and performance than other factory overclocked cards on the market. Call it top-shelf, top-of-the-line, top-notch, or whatever works for you, but from what I've seen, the EN7900GS TOP/2DHT/256M offers one of the fastest core clock speeds of any 20-pipe GeForce 7900GS I've seen to date, at 590MHz.

Asus also goosed up the memory interface speed a bit beyond standard GeForce 7900GS specs, from 660 to 720MHz. Interestingly, the card isn't equipped with anything special in terms of cooling, so in order to hit these clock speeds, Asus must simply be binning GPU and memory components that are capable of hitting these new heights. The good news is Asus backs up this heavy-duty overclock with its standard three-year warranty; you can rest easy that the card is fire-tested and battle-approved at these speeds.

When I sent the EN7900GS TOP/2DHT/256M through our standard benchmark gauntlet, I was rather impressed with the results. The card puts up top-shelf scores compared to others in its class. But its price tag is a little on the top-shelf side, as well, commanding roughly a $50 premium over a stock GeForce 7900GS card, which typically cost $199. But life is short; why go for the flank steak when you can have filet mignon? ▲

by Dave Altavilla

EN7900GS TOP/2DHT/256M
$249
Asus
usa.asus.com
●●●●

Asus EN7900GS TOP/2DHT/256M	
3DMark06	
Overall	5182
SM2.0	2119
HDR/SM3.0	2058
F.E.A.R. 1.07	
1,600 x 1,200 4XAA/8XAF	39
Prey	
1,600 x 1,200 4XAA/16XAF	46.8
Half-Life 2: Episode 1	
1,600 x 1,200 4XAA/16XAF	50.67

Specs: GPU: GeForce 7900 GS; GPU clock: 590MHz; Memory 256MB (720MHz); dual-DVI outputs

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Logitech Wireless DJ System

Pick up a remote, dial up a playlist, and listen to your PC's audio files on your home stereo. Logitech doesn't do anything by halves, so rest assured that this wireless streaming system is nearly perfect out of the box.

The Wireless DJ Music System's rechargeable remote gives you full control over the songs, podcasts, and Internet radio stations it plays, including volume, skip forward/backward, and pause. Its backlit blue display shows you the title, artist, and other metadata. You can create ad hoc playlists on the remote and add songs without disrupting the current tune.

Thankfully, the Wireless DJ uses its own 165-foot Bluetooth 1.2 Advanced Audio Distribution Profile link, so you don't have to worry about integrating it into your WLAN nor dumbing down your network's encryption to support it. Audio quality sounded very similar to a cabled connection (audiophiles might argue), even at 50 feet with a steel I-beam, floors, and walls in the way. However, the signal became choppy under heavy CPU loads.

Logitech's StreamPoint software imports your playlists and songs from iTunes, Windows Media Player, and MusicMatch Jukebox. It's supposed to gather files directly from folders, too, but it couldn't assimilate my M3U playlists until I imported everything into WMP and reinstalled StreamPoint. There's also a limited-function PC Control mode to transmit any audio your PC is playing.

Be aware that the Wireless DJ is stereo audio only—no 5.1 sound or video. StreamPoint might also choke on some DRM files, Logitech says (without mentioning specifics), but PC Control mode is the fallback option.

Logitech made the remote's firmware upgradable and StreamPoint updatable and says that my only usability complaint—a lack of a faster way to scroll down a long list—may be fixed by the time you read this. I like this thing. ▲

by Marty Sems

Wireless DJ Music System
$249.99
Logitech
www.logitech.com
●●●●◖

Specs: Supported formats: MP3, WMA, M4A, M4P; Internet radio; 2.4GHz Bluetooth A2DP

Asus P5NSLI

If you're in the market for a Core 2 Duo-based system with the ability to run a multi-GPU setup, Nvidia's nForce 570 SLI Intel Edition chipset is an inexpensive option that doesn't cut many corners. Asus built its P5NSLI around the chipset, which supports all Core 2 Duo variants, including Core 2 Extreme X6800.

The motherboard boasts a pair of PEG slots and supports dual Nvidia graphics cards in SLI on a pair of x8 PCI Express connections. There are also three PCI-E x1 and two standard 32-bit PCI slots for future expansion. The P5NSLI has a single Gigabit Ethernet port. As far as storage goes, four SATA ports available off the Nvidia MCP support RAID 0, 1, 0+1, 5, and JBOD configurations.

However, the P5NSLI's full-featured BIOS is probably one of the most interesting features of this motherboard. There are a slew of settings for both timings and voltages for virtually all chip-level interfaces on the board. In fact, we took our Core 2 Duo E6700 2.66GHz chip up to a snappy 3.5GHz with the P5NSLI's help.

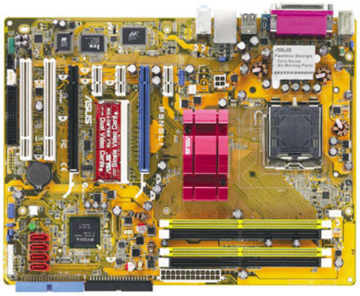
In our standard suite of benchmarks, the P5NSLI took a competitive Intel 975X-based motherboard to task, trading punches with it every step of the way in office applications, such as Photoshop, Office XP, and even more strenuous workstation apps.

But the key difference between the two platforms is multi-GPU support. The P5NSLI obviously offers Nvidia, and 975X board delivers support for ATI's CrossFire.

In high-res gaming at 1,600 x 1,200 on the P5NSLI, games such as F.E.A.R. and Quake 4 showed nearly a two-fold increase in performance with a pair of GeForce 7900 GTX cards at the helm.

At press time, Asus didn't have the P5NSLI motherboard listed as supporting Intel's quad-core processors, but Core 2 is still a great gaming processor. And the P5NSLI is a great motherboard for an Nvidia-based gaming platform. ▲

by Dave Altavilla



P5NSLI
$119
Asus
usa.asus.com
●●●◖

For performance results, see our chart at www.cpumag.com/cpu/dec06/p5nsli

Specs: Chipset: Nvidia nForce 570 SLI Intel Edition; Max memory: 16GB DDR2-667/533; SLI (two x8 links); Slots: 2 PEG, 3 PCI-E x1, 2 PCI

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

ATI Radeon X1950 Pro

High-end graphics cards always steal the headlines. Unfortunately, these cards will also steal your wallet if you opt to purchase one. Just as the dust settled from the X1950 XTX release, ATI's Radeon X1950 Pro arrives on the scene, which ATI offers alongside the existing Radeon X1900GT to compete with the GeForce 7900GT and 7900GS cards.

The X1950 Pro is based on the R570 GPU, which is essentially a cut-down R580 built using a more power-friendly 80nm process. Because of the more energy efficient design, ATI equipped the X1950 Pro with a svelte single-slot cooler. A translucent red shroud envelops the card's copper heatsink and exhausts heated air through the top of the card. This card also boasts native CrossFire support.

The addition of native CrossFire is a welcome—and long overdue—improvement. Native CrossFire technology eliminates need for master and slave card distinctions when configuring a CrossFire setup. ATI also ditched the cumbersome dongle in favor of two SLI-esque CrossFire bridge interconnects, which span between the two cards. In a bid to broaden the list of motherboards that support CrossFire, ATI constructed the interconnects with a flexible material to allow for irregularly-spaced PEG slots. The PEG slots on the Sapphire PC-AM2RD580 motherboard I used for my test system were two inches apart, but the flexible interconnects let you set up CrossFire in a system with slots positioned even closer together. On paper, the X1950 Pro supports socket 939 and AM2 AMD motherboards and 975X and P965 Intel motherboards.

The X1950 Pro also supports what ATI refers to as stream computing, otherwise known as GPGPU (general-purpose computation on a GPU). Stream computing won't get you any more frames per second in Quake 4, but it is a method of using the floating-point processing muscle of select ATI GPUs to perform tasks that CPUs traditionally handle, only several times faster than even the fastest CPUs from both AMD and Intel. The Folding@Home project, for example, uses ATI cards to study protein folding. Other potential applications include medical research, security data analysis, financial analysis, seismic modeling, and media encoding.

The Radeon X1950 Pro features a 575MHz core clock speed and 256MB GDDR3 memory with a 690MHz memory clock (1.38GHz effective). The unit I tested included two DVI-I display connectors and a VIVO connector. The X1950's list of specs also includes 36 pixel shaders and eight vertex shaders.

For the game benchmarks, I used the Catalyst Control Center to set the antialiasing to 4X and the anisotropic filtering to 8X. The display settings remained a consistent 1,600 x 1,200. The X1950 Pro also supports HDR rendering, which I tested using a manual benchmark of Oblivion. As the test results illustrate, the Radeon X1950 Pro performed admirably against ATI's flagship X1950 XTX. In CrossFire, the X1950 Pro showed a drastic leap in performance, trouncing a single X1950 XTX in every benchmark but F.E.A.R.

Bottom line: the Radeon X1950 Pro is a solid-performer but nothing special for the enthusiast. However, at an SRP of $199 each, two of these cards in CrossFire can give even the big dogs a run for their money. ▲

by Andrew Leibman

Benchmark Numbers

	Radeon X1950 Pro	Radeon X1950 Pro CrossFire	Radeon X1950 XTX	Radeon X1950 XTX CrossFire
3DMark06	4707	7985	6131	9247
3DMark06 HDR/SM3.0	1941	3727	2686	4603
Far Cry 1.33 (1,600 x 1,200; 4XAA; 8XAF)				
Training	71.54	119.86	106.8	132.98
Research	88.78	152.64	135.12	191.95
F.E.A.R. (1,600 x 1,200; 4XAA; 8XAF)*	35	50	53	81
Quake 4 (1,600 x 1,200; 4XAA; 8XAF)**	32.53	57.59	52.41	87.15
Oblivion (1,600 x 1,200; 4XAA; HDR; 8XAF)				
Outdoor	12.42	31.99	25.33	48.99
Town	30.43	66.75	60.49	64.96
Dungeon	43.22	68.75	63.85	72.36

*Soft Shadows Disabled
**Dual-core CPU support enabled

Specs: GPU: Radeon X1950 Pro; GPU (575MHz); 256MB GDDR3 memory (690MHz); 36 pixel shaders; 8 vertex shaders

Radeon X1950 Pro
$199
ATI
www.ati.com
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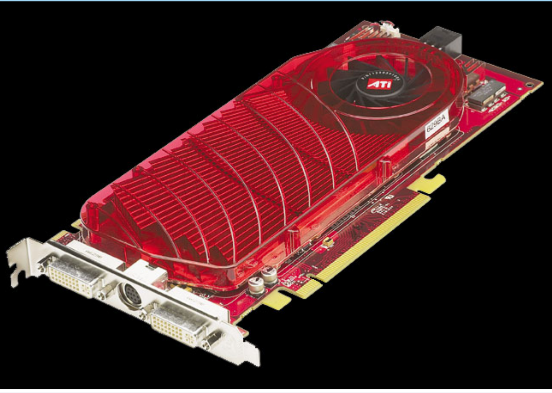


CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Cyberpower Gamer Infinity SLI KO

It's a great time to be a gamer: Intel is taking names with its quad-core processor, and Nvidia's new GeForce 8800 GTX is smokin'. System builders have been anxiously awaiting the arrival of these new parts, and so have we. The first system to burst through our doors thusly equipped is the Gamer Infinity SLI KO, Cyberpower's top-shelf gaming rig.

The Intel Core 2 Extreme QX6700 is plenty powerful. It runs at 2.66GHz and has a 1,066MHz FSB, four cores, and 8MB of L2 cache. Even so, Cyberpower overclocked the CPU to 3.2GHz with the help of a Cooler Master liquid cooling kit. The kit includes a single-fan radiator that sits at the back of the system and a CPU block; the rest of the PC relies on air cooling.

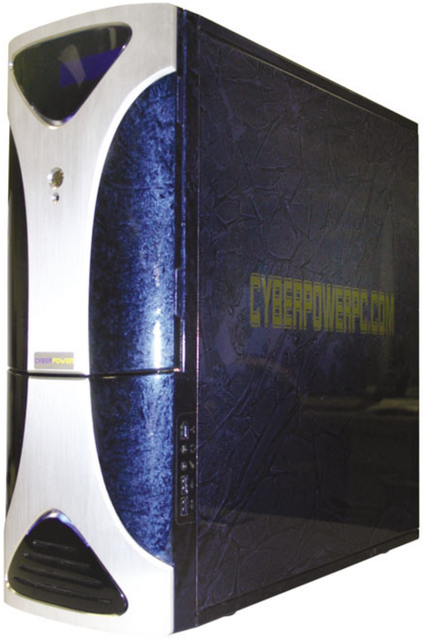
The two 768MB Evga Nvidia GeForce 8800 GTX PCI Express cards are, of course, configured in SLI mode. The cards offer a variety of new treats, including a unified architecture that lets the GPU keep all of its brainpower busy even when working on scenes that are heavy on a particular type of rendering. They also support DirectX 10. Each card eats up two PCI bays and requires two PCI-E power connectors, so Cyberpower opted for an Nvidia SLI-certified 750W Thermaltake Toughpower power supply.

Cyberpower built this system on the Nvidia 680i SLI chipset and added 2GB of Corsair PC2-6400 memory (two 1GB DIMMs). On the storage side of things, Cyberpower selected a 300GB Hitachi Deskstar HT725032VLA360 and followed it with four 150GB Western Digital Raptors at 10,000rpm each (in a striped array).

Cyberpower's stable of high-end rigs includes a variety of flashy PC cases; one of the coolest it offers is the NZXT ZERO chassis. The case includes a custom Blue Multi Tone paint job that looks like the sort of sinewy material that coats the walls in many sci-fi movies. A window in the front panel door lets you catch a glimpse of the fan controller's readout (the fan controller's display features blue backlighting). Rather than yet another case window, this chassis has a huge grille covering four 120mm intake fans.

The front panel houses the fan controller, two optical drives (a dual-layer NEC ND-3550A DVD±RW and a Sony DDU1615 DVD-ROM), and a card reader that includes a USB 2.0 port. Two more USB ports sit on the side of the front panel. The front panel door is reasonably sturdy and the five 5.25-inch bays have drive rails that will make installation a breeze.

I found a decent wiring job inside the case; Cyberpower bundled most of the cables out of the way and used several cable ties to secure the power cable and SATA cables that connect to the hard drives. The cable ties kept the cords together but didn't keep the hard drive power connectors from detaching during shipping. That's not a big problem, but if I spent $3,999 on a system, I'd be nonplussed when it didn't boot out of the box.



Gamer Infinity SLI KO
$3,999
Cyberpower
www.cyberpowerpc.com
●●●●

Although the Gamer Infinity SLI KO produced great scores in every benchmark, it absolutely rocked 3DMark06, producing an overall score of 1551. The cards produced an HDR/SM3.0 score of 7005 and CPU score of no less than 4781. The system also handled the gaming benchmarks well, posting 97.44fps in our Oblivion Outdoor test. When I kicked the cards up to 8X SLI AA and 16XAF, the system posted 68.73fps in the Oblivion test, 64fps in F.E.A.R., and 141.16fps in Far Cry. The system also fared well in our Dr. DivX and WinRAR tests, finishing off the test files in 3:43 and 2:39 (minutes:seconds), respectively.

Hefty though the Gamer Infinity SLI KO's price tag is, you get a great box load of components for the price, as well as an expertly built system and a stunning paint job. And of course, the system more than delivers on performance: It clobbered our benchmarks. Now it's just sitting around, eagerly waiting for some competition. ▲

by Joshua Gulick

Benchmark Numbers

3DMark06	SM2.0	HDR/ SM3.0	CPU	*F.E.A.R.	"*Far Cry Training"	*Oblivion Outdoor	**Dr. DivX	**WinRAR
15551	6134	7005	4781	120fps	189.22fps	97.44fps	3:43	2:39

* Games run at 1,600 x 1,200, 4X AA, 8X AF
** (minutes:seconds)

Specs: 2.66GHz Intel Core 2 Extreme QX6700 @ 3.2GHz, 2GB Corsair PC2-6400 DDR2-800, 768MB Nvidia GeForce 8800 GTX (x2 SLI) 150GB Western Digital Raptor 10,000rpm (x4; RAID-0), 300GB Hitachi Deskstar HT725032VLA360 7,200rpm, NEC ND-3550A DVD+-RW DL, Sony DDU1615 DVD-ROM, Dual Gigabit LAN, WinXP Pro

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Introducing Antec's NINE HUNDRED advanced gaming case. With all of its high performance features, like a massive 200mm cooling fan and nine ventilated drive bays, you'll have an unfair advantage over your competition (just the way it ought to be). For more information about the Antec's Nine Hundred visit **www.antec.com**.

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Anand's Corner

Quad-Cores Are Coming, When Will You Need Them?

by Anand Lal Shimpi

Now that Intel has publicly announced the chips, just about everyone knows that the Core 2 Extreme QX6700 is not just any Core 2-based processor. At $999, you get a total of four cores running at 2.66GHz, up from the usual two in all of the other Core 2 chips. Given its price tag, you have an interesting decision to make: Do you spend $999 on the dual-core Core 2 Extreme X6800 with a 2.93GHz clock speed, or do you give up the extra speed for two more cores with the QX6700?

When AMD and Intel introduced the first dual-core CPUs, you had to make the same trade-off between clock speed and cores, and back then it made sense to opt for more cores. So long as you were running a multithreaded OS and did a fair bit of multitasking, you could appreciate the benefits of dual cores right away, regardless of whether you had multithreaded apps. Obviously, these days it's pretty difficult to find a processor that doesn't have two cores unless you look at the lower end of the market.

When going from two to four cores, however, the differences aren't as noticeable, even for heavy multitaskers. Of course, if you're running very heavily multithreaded applications that are CPU-bound (think video encoding or 3D rendering), the performance difference will be quite visible even if you're not multitasking. But the seat-of-your-pants feel of an upgrade from two to four cores is going to be far less noticeable if the majority of your applications aren't multithreaded and you're just a heavy multitasker. The more multitasking you end up doing, the faster you'll need your I/O system to be in order to not feel horrendously bottlenecked by it. That's the one thing I noticed become more of a limitation as I went from two to four cores under OS X; I felt more disk-bound than I did beforehand because I was less CPU-bound when multitasking.

Applications will get more and more multithreaded as time goes on, and I am expecting Windows Vista and its associated applications to be far more threaded than its predecessors under Windows XP; even much of Office 2007 is multithreaded. But in the grand scheme of things, I strongly expect 2007 to be the year that dual core matters far more for individual application performance than it has in the past.

Threaded software development will extend beyond applications and move into the gaming world, as well, an area where programs have historically been mostly single-threaded. By the end of next year, I'm hoping to have a handful of games that are multithreaded enough that you get a benefit from two cores vs. one. Titles like Unreal Tournament 2007, Alan Wake, and just about any game that's been developed for PS3 and/or Xbox 360 should be threaded in such a way that they at least take advantage of two cores. Remember that you pretty much need to heavily multithread your games in order to get good performance on the 360 and PS3's CPUs, so titles being developed for those consoles as well as the PC will inevitably be well-threaded. Alan Wake in particular is expected to not even run on single-core CPUs without Hyper Threading support, which is a far cry from what I've seen with games and their support for multiple cores in the past. Alan Wake will spawn five threads: one each for rendering, physics, audio, streaming and decompressing data (off of the DVD/HDD), and terrain tessellation, hence the dual-core CPU requirement.

Realistically, as much as I'd like to see everything threaded beyond belief in the next year, I wouldn't expect four cores to be a big deal until late '07 at the earliest. Personally, if I were choosing between a dual-core proc at 2.93GHz or a quad-core at 2.66GHz, I'd go for the latter at the same price; you can always overclock to make up the difference, but you can't add more cores after the fact. But if you're stressing between spending $400 on a dual-core CPU or saving up and waiting for the quad-core revolution, it's going to be a while, a while during which you could be enjoying two quite fast cores today. ▲

Holiday Wish List

1. Nvidia's GeForce 8800
2. Intel's Core 2 Extreme QX6700
3. A full QWERTY BlackBerry with camera (please)
4. For our house to be complete; living with contractors isn't fun
5. Gears of War
6. Splinter Cell: Double Agent
7. . . . or any other Xbox 360 game to make this console worthwhile
8. PlayStation 3
9. . . . and maybe one good launch title?
10. An SED TV

The more multitasking you end up doing, the faster you'll need your I/O system to be in order to not feel horrendously bottlenecked by it.

Talk back to Anand at anand@cpumag.com.

by Alex "Sharky" Ross

Watching The Screens Go By

Over the years I've noticed a certain trait my geek friends and I all share: We change our PC hardware even more often than I change socks—and I change those twice a day here in summer. Whether it's CPUs, motherboards, video cards, heatsinks, hard drives, sound cards, or even cables, there is still one stone left unturned: the display.

It's not that I'm still using a 14-inch NEC (non-flat I might add) CRT screen, but over the years I can count on one hand the displays I've had. I can go back as far as 1996 starting with a then astronomically priced G400 19-inch Sony, which was just fine and dandy for all things Duke Nukem 3D. I stuck with Sony and upgraded to a 21 incher a couple of years later for 1,600 x 1,200 gaming (Quake 2 and others). I then added a second 21-inch Sony for dual-head/twin-view/Hydravision just because it was more practical for general Windows usage. Once the response times were reasonable for gaming, in 2002, I finally switched to a couple of 21-inch Dell flat-panel LCDs and enjoyed Call Of Duty, Medal Of Honor, and then some. I briefly dabbled with a 24-inch FPW just because games such as Half-Life 2 had built-in widescreen modes. Now where am I going with all of this? All the way up to 42 inches of widescreen, flat-panel LCD gaming courtesy of what is quite possibly my favorite "toy" to date: the Westinghouse LVM-42w2. Gaming or even Web browsing really doesn't get much better than this—so much so that I've stopped messing about with the XBox 360 on the plasma.

The first thing that grabbed me about the LVM-42w2 was its 1080p support. There aren't many displays that are truly 1,920 x 1,080 native in today's market. The LVM-42w2 doesn't simply "upconvert" the signal internally from 480i/480p/720p like most of the plasmas and LCD TVs that you see with 1080p stickers. Even though it's unlikely that 1080p sources are in many households at this time (Blu-ray aside), us gamers can still use that resolution for Windows XP and, of course, games. The 8ms response time helps to pull off even the most tearing/ghosting prone games (first-person shooters). The 1,000:1 contrast ratio and 550cd/m^2 also help deliver superb, bright colors.

The I/O ports, cleverly located on either side of the panel instead of behind, are mostly what you'd want, including two DVI-D inputs and a single HDMI. (I wish there were two HDMI ports.) Having only a single HDMI means that you'll likely have to hook it up to an HDMI-capable audio receiver so that you can switch between the PC, DVD player, and/or HDTV. The LVM-42w2 truly is a "monitor," so don't expect any fancy built-in HDTV tuners or CableCard slots. In case you're wondering, the monitor also sports component and S-Video. The unit isn't only thin, at only 4.5 inches, but also weighs only 52 pounds without the stand, which makes mounting it on a wall a breeze.

But the LVM-42w2 isn't without a couple of faults; for example, the remote looks like it belongs to a 1980s Aiwa Boombox. The calibration mode for the monitor is both restrictive and limited; although, if you want to void the warranty, there are ways to unlock the "service" mode. The hidden speakers and 10W sub are no better than a pair of $19.99 Labtec speakers. But, what the LVM-42w2 lacks in terms of "traditional" features it more than makes up for in terms of price. If you can find a LVM-42w2 monitor (they're in high demand/short supply), expect to pay less than $2,000.

Right now I can't think of any better large-screen LCD for your PC. The performance and features also let it double up as your home theater display. DVD movies and HDTV broadcasts arguably aren't up to the standard of a Pioneer Elite plasma, but they were free of artifacts. However, LVM-42w2 doesn't cost $4,000, either, and plasmas aren't really viable for PC gaming (think of the burn-in) anyway. Watching a 1080p "Terminator 2" HD demo clip in Windows Media was truly something else. By the time you read this, though, I'll be hunting around for the 47-inch version of the same panel. Happy hunting. ▲

Holiday Wish List

1. *Somebody please find me a stocking that's 47 inches wide.*
2. *A 47-inch wide LVM-47w1 monitor.*
3. *For the 997 GT3RS order to come in early!*
4. *A laptop that I can game on without applying a sauna to my lap.*
5. *PlayStation 3 . . .*
6. *. . . and the latest version of Gran Turismo.*
7. *More WWII first-person shooters.*
8. *To never, ever have to use QuickBooks again—ever.*
9. *To never have to smog a car again—ever.*
10. *For the ATI and AMD merger to actually work out.*

> All the way up to 42 inches of widescreen, flat-panel LCD gaming courtesy of what is quite possibly my favorite "toy" to date: the Westinghouse LVM-42w2.

Email me at sharky@cpumag.com

PC Modder

Tips & Tutorials

Modding does the body good. A PC's body anyway, inside and out. Here you'll find hardware, firmware, tools, tips, and tutorials for modding your rig's performance and appearance. Send us your own mod-related tips and ideas at modding@cpumag.com.

Modding enthusiasts have a penchant for the latest toys. Fast processors, powerful video cards, silent SFF enclosures, and radically lit motherboards are all fair game when it comes to a modder's creative mind. Recognizing the appeal of unconventional customization, an entire industry has emerged to support the community.

Mods & Ends

Swiftech MCP355 Water Pump

Swiftech recently added a new water pump to its product lineup, the miniscule MCP355 ($79.95). This update to the popular MCP350 features significantly increased head and flow characteristics, which ultimately result in higher performance. Unfortunately, higher performance comes at the cost of increased noise output in this instance, but at 30~32dBA, the MCP355 is still quieter than most high-end air coolers.

Although it's relatively small, the MCP355 uses a unique pump design to deliver high performance in complex liquid-cooled systems, such as those that feature multiple waterblocks and multiple water-cooled components. The pump consists of a single moving part—an electronically commutated, brushless DC, spherical motor.

Swiftech's new MCP355 water pump packs a lot of performance into a small package.

The MCP355 is designed for high-performance, liquid-cooled applications where a powerful pump is required, but space is at a premium. For convenience, it operates on 12V and plugs directly into a system's power supply. The pump also features standard 3/8-inch barb fittings and requires no maintenance when you use it in conjunction with de-mineralized water with antifungal additives. The pump's specifications list a minimum starting voltage of 9V, power consumption of 18W, and an impressive—considering its size—20.2 feet of head with 120GPH (gallons per hour) discharge.

Enermax Galaxy 1000 EGA1000EWL

As today's graphics cards and processors have become more powerful, the need for high-capacity power supplies has increased exponentially. To date, the highest-capacity consumer PSU we'd seen was PC Power & Cooling's Turbo-Cool 1KW, but Enermax recently added a 1kW model to their arsenal, as well. And thankfully, Enermax's is a bit more affordable.

The new Galaxy 1,000W EGA1000 EWL ($365) can supply up to 75A through its five +12V rails, which is more than enough for any of today's multi-GPU/high-performance processor configurations. The PSU also features modular cables, quad 6-Pin PCI Express power leads, and a high-efficiency design that is 85% efficient under some conditions. Its oversized 13.5cm fan silently keeps the unit's internals cool.

Thermaltake Flow TX

Fans of liquid cooling know that it's not always easy to check that liquid is properly flowing through their systems: Many of today's popular pumps are silent, and the tubing used isn't always transparent or even easily visible. In situations like these, incorporating one of Thermaltake's new Flow TX ($17.99) flow indicators can be a lifesaver. The Flow TX is an in-line flow indicator that features a red propeller which spins rapidly as liquid passes through. The Flow TX comes complete with quick install connectors for both 1/4- and 3/8-inch tubing for easy integration into almost any liquid cooling system.

Thermaltake's Flow TX flow indicator makes it easy to keep an eye on the liquid circulating through a water cooling system.

Fashionably Fresh Firmware

Sony Alpha DSLR-A100 (v1.1)

Sony has released a firmware update for their DSLR-A100, DSLR-A100K, and DSLR-A100W D-SLR cameras. This firmware update fixes an issue opening RAW images, improves image gradation when a users sets the shutter speed to one second or longer, and improves print quality when the camera is used in conjunction with Epson printers under PRINT Image Matching.

esupport.sony.com

Nokia E61 (v2.0)

An update for the Nokia E61 smartphone incorporates a long list of bug fixes, which includes improvements in audio quality, optimized RAM consumption when running Java applications, recurring events improvements, and overall performance and stability.

www.nokia.com

BenQ DW1670 DVD-R (v1.03)

The latest update for BenQ's DW1670 DVD-R drive improves read and write performance and adds compatibility with different types and brands of media.

ftp.benq-eu.com

by Marco Chiappetta

Balance The Equation

Tweaking An Already Overclocked PC

We used an nForce 4 SLI X16-based Asus A8N32-SLI Deluxe motherboard in this mod, but the process we followed to tweak our system's performance pertains to almost all high-end motherboards for either AMD or Intel processors.

As power users, we suspect most of you spend much of your spare time tweaking or otherwise optimizing your systems for maximum performance. We know this because we do the very same thing. In fact, we do it so much we sometimes get lax in our pursuit of performance and settle for "good enough" when perfection is only a few short steps away. And we'd bet a lot of you do the same on occasion.

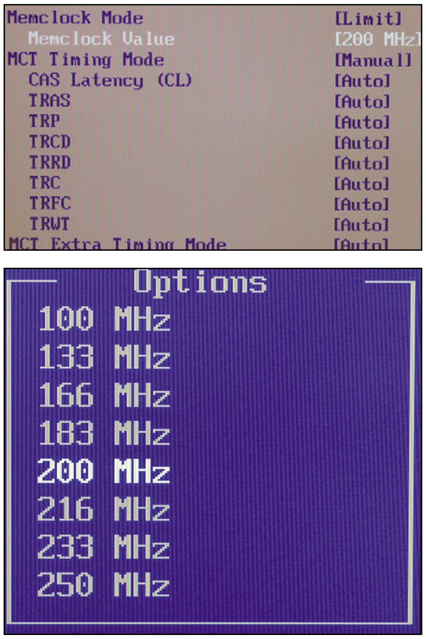
This is usually what happens when overclocking a system. In most scenarios, once the rig is adequately cooled, overclocking it means little more than cranking up some voltages and the FSB frequency on Intel-based systems or the HyperTransport reference clock on AMD-based systems and letting fly. However, you can gain a measurable amount of performance by taking things a step or two further and finding the right balance between CPU, memory, and FSB/HT frequencies. Altering a handful of settings, namely the processor multiplier and memory divider, makes all the difference.

The Players

We began this project with a handful of known quantities. The system we planned to tweak and modify consisted of an Athlon 64 FX-60 processor that we had previously topped out at about 2.9GHz with air-cooling at a healthy voltage of about 1.55V. AMD's FX series of processors is unlocked, so you can use either higher or lower multipliers, which is also the case with Intel's Extreme Edition processors. Mainstream processors only allow for lower multipliers, however. We installed our processor in an Asus A8N32-SLI Deluxe, which uses Nvidia's nForce 4 SLI X16 chipset. We've seen this motherboard surpass a very respectable 290MHz HyperTransport reference clock speed with the chipset's voltage slightly increased. Finally, our memory consisted of an OCZ EB DDR PC-3700 2GB Platinum XTC Dual Channel Kit that's rated for operation at 466MHz (DDR) with 3-3-2-8 timings at 2.7V. With a bump in voltage to 3.05V, though, higher memory clock speeds are almost a given: We've taken these modules beyond 530MHz without experiencing too many problems.

Lock & Load

Because we knew the limits of our processor, motherboard, and memory, we were able to spend some time fine-tuning our overclock to wring as much performance from the system as possible. There are a number of ways to hit 2.9GHz with an FX-60 processor. You could simply raise the HT clock to 223MHz or bump it to 208MHz with a 14 multiplier. You could even lower the multiplier and raise the HT clock in any number of combinations, which is what we planned to do, to achieve maximum performance. But before we could, we



```
Memclock Mode                                [Limit]
  Memclock Value                             [200 MHz
MCT Timing Mode                              [Manual]
  CAS Latency (CL)                           [Auto]
  TRAS                                       [Auto]
  TRP                                        [Auto]
  TRCD                                       [Auto]
  TRRD                                       [Auto]
  TRC                                        [Auto]
  TRFC                                       [Auto]
  TRWT                                       [Auto]
MCT Extra Timing Mode                        [Auto]
```

```
   Options
 100 MHz
 133 MHz
 166 MHz
 183 MHz
 200 MHz
 216 MHz
 233 MHz
 250 MHz
```

Locking in the memory clock speed, which basically manually sets the memory divider, is essential to achieving maximum performance. If you leave the memory clock speed option on "Auto" in the system BIOS, the actual frequency will fluctuate based on whatever memory divider is used. By manually setting the memory clock speed to 200MHz, we locked the memory-to-HyperTransport ratio to 1:1.

needed to alter a couple of settings in our rig's system BIOS.

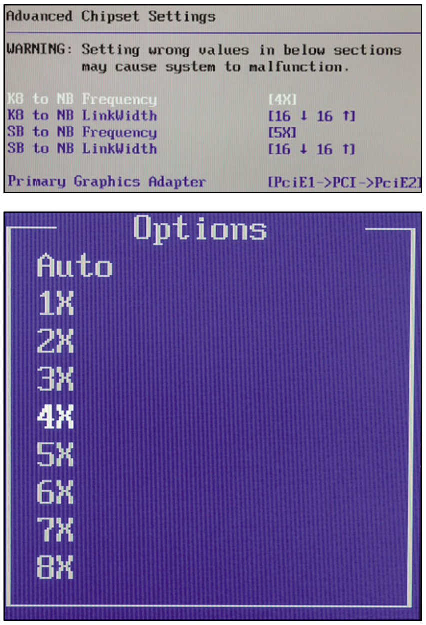
Our first mission was to manually lock in our base memory frequency at 200MHz (400MHz DDR). On some motherboards, this option will simply list the available baseline memory frequencies, but on others it may be displayed as a ratio or divider; all do the same thing, though. By locking the memory clock at 200MHz, we set the memory-to-HT clock ratio to 1:1 (also known as setting the divider to 1). Had we locked the memory clock at 166MHz, the ratio would have been 2:3; at 100MHz the ratio would be 1:2, and so on.

Running the system memory synchronously with the HT reference clock (or FSB on Intel systems) usually offers the best performance, which is why we manually configured our rig with a 200MHz base memory clock. By doing so, as we raised the HT reference clock, the memory clock frequency would increase in lockstep. And because we knew our particular motherboard had no trouble reaching roughly 290MHz, we knew an HT clock speed of approximately 265MHz to boost our memory to 530MHz was definitely possible.

The Missing Link

Hitting a 265MHz HyperTransport clock speed isn't always possible on AMD processor-based systems, however. The HT reference clock speed also determines the ultimate clock speed of the link between the CPU and chipset. In a stock configuration on Socket AM2- and Socket 939-based systems, the HT link's default clock speed is 1GHz (2GHz DDR). The default HT multiplier of 5 and 200MHz default HT reference clock combine to produce this speed. Raising the HT reference clock to the 265MHz range without lowering that multiplier would result in an actual link speed of over 1.3GHz, which is too high for most systems.

Because the speed of the link between the processor and chipset doesn't have a major impact on performance, it's best to keep the link operating as close to 1GHz as possible to keep the system stable. For our purposes, we dropped the HyperTransport link multiplier to 4, which would keep the link operating below 1.06GHz with a reference clock of 265MHz.

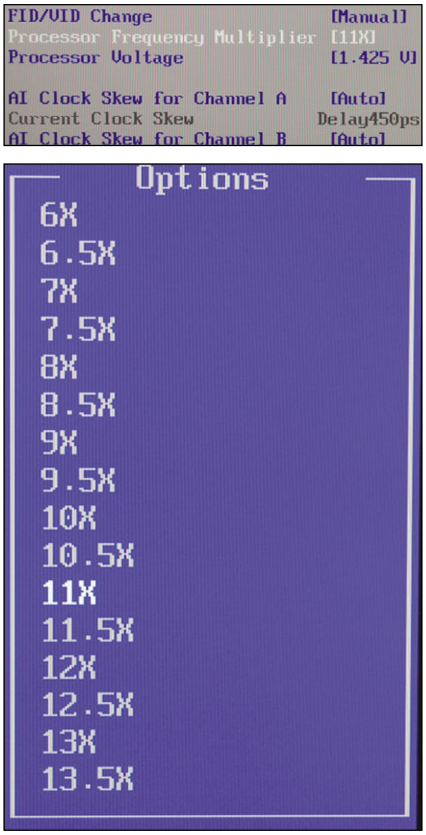


```
Advanced Chipset Settings

WARNING: Setting wrong values in below sections
         may cause system to malfunction.

K8 to NB Frequency                  [4X]
K8 to NB LinkWidth                  [16 ↓ 16 ↑]
SB to NB Frequency                  [5X]
SB to NB LinkWidth                  [16 ↓ 16 ↑]

Primary Graphics Adapter            [PciE1->PCI->PciE2]
```

On the AMD platform, dialing down the HyperTransport link speed between the processor and chipset by lowering its multiplier will usually give you the ability to hit higher memory frequencies. Just do the math and keep the HT link at around 1GHz. On our system, we dropped the multiplier to 4 and raised the reference clock to 263MHz, which resulted in a 1.05GHz HT link frequency.

Lower The Multiplier

With our memory speed dialed in and the HyperTransport link multiplier set accordingly, we were ready to lower our processor's multiplier. By default, AMD set the 2.6GHz FX-60's multiplier to 13 (13 x 200MHz = 2.6GHz). You can determine any processor's default multiplier by dividing its stock clock speed by its default FSB/HT frequency. We knew this particular CPU could overclock to about 2.9GHz and that our memory was comfortable around 265MHz, so we simply divided 2,900 by 265 to get a good starting point of 11. (The actual number was closer to 10.9, but most motherboards only offer whole or half multipliers, so we rounded up to the closest available option, which was 11.)



```
FID/VID Change                      [Manual]
Processor Frequency Multiplier      [11X]
Processor Voltage                   [1.425 V]

AI Clock Skew for Channel A         [Auto]
Current Clock Skew                 Delay450ps
AI Clock Skew for Channel B         [Auto]
```

An Athlon 64 FX-60's rated clock speed of 2.6GHz is derived by multiplying 13 (its stock multiplier) by 200MHz, the default HyperTransport reference frequency. Lowering the processor's multiplier allows for higher HT frequencies without having to drastically affect the CPU's clock speed. After finding our particular processor's maximum stable clock speed, we experimented with lower multipliers and higher HT frequencies until we struck the right balance.

We should also note that some platforms, such as AMD's socket AM2, don't offer half multiples to determine memory speeds. So, with odd-numbered CPU multipliers, you could change the memory speed to something lower than desired. With an Athlon 64 FX-62 for example, a 200MHz base frequency and a 14 core multiplier results in a 2.8GHz core speed. That, along with an x7 memory divisor (2800/7) results in a 400MHz memory speed, or DDR2-800. But for an Athlon 64 X2

5000+, which has an odd multiplier of 13 to reach its 2.6GHz core clock, the processor must divide by a whole number to get close to—but not go over—400MHz, which equates to 2600/7 or 371MHz.

Increase The Clocks

Now that we had manually set our memory clock and lowered our HyperTransport and processor multipliers, we were ready to start cranking up the HT reference clock frequency. As we've mentioned, by default, the HT reference clock is 200MHz. We immediately jumped to 225MHz, and the system ran without a problem. Next, we tried 235MHz, 245MHz, and 255MHz in succession, and the system kept purring along. But at 265MHz, we booted into Windows, but the system wasn't completely stable. We nudged the memory voltage to 3.1V to recover some stability, but it wasn't perfect yet. When we backed off on the HT reference clock a bit, the system finally stabilized at 263MHz. We suspect our memory was hitting a wall, so we might have taken things a little further with a more overclockable PC4000 memory kit.

We're not complaining, though. Our tweaks netted us an additional 800MBps of memory bandwidth, which increased the performance of our system in a number of real-world applications. And that's not bad for a couple of hours of experimenting with settings in the system BIOS. ▲

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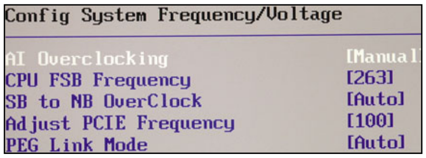
by Marco Chiappetta



```
Config System Frequency/Voltage

AI Overclocking                    [Manual
CPU FSB Frequency                  [263]
SB to NB OverClock                 [Auto]
Adjust PCIE Frequency              [100]
PEG Link Mode                      [Auto]
```

By locking in the memory divider, cranking up the HyperTransport reference clock speed to 263MHz, and dropping our CPU's multiplier to 11, we were able to keep our processor's clock speed close to its maximum stable frequency of 2.9GHz while significantly increasing the amount of available memory bandwidth.

Performance: Before & After The Mod

To illustrate the performance benefits of modifying a system by altering its processor's multiplier and ultimately its memory clock speed, we ran a number of benchmarks on our system in a trio of configurations. We recorded the first set of benchmark scores with the system running in its stock configuration. Before recording the second set, we overclocked the system's processor to 2.9GHz after raising its multiplier and HT reference clock to 13 and 208MHz, respectively. Finally, we recorded the final set with our processor's multiplier set to 11 and the HT reference clock set to 263MHz, which resulted in a 2.89GHz CPU clock speed.

In addition to the motherboard, memory, and processor we mentioned, the system contained a GeForce 7900 GTX video card. We installed Windows XP Professional with SP2 along with Nvidia's Forceware v91.47 drivers on the system's Western Digital 74GB Raptor hard drive.

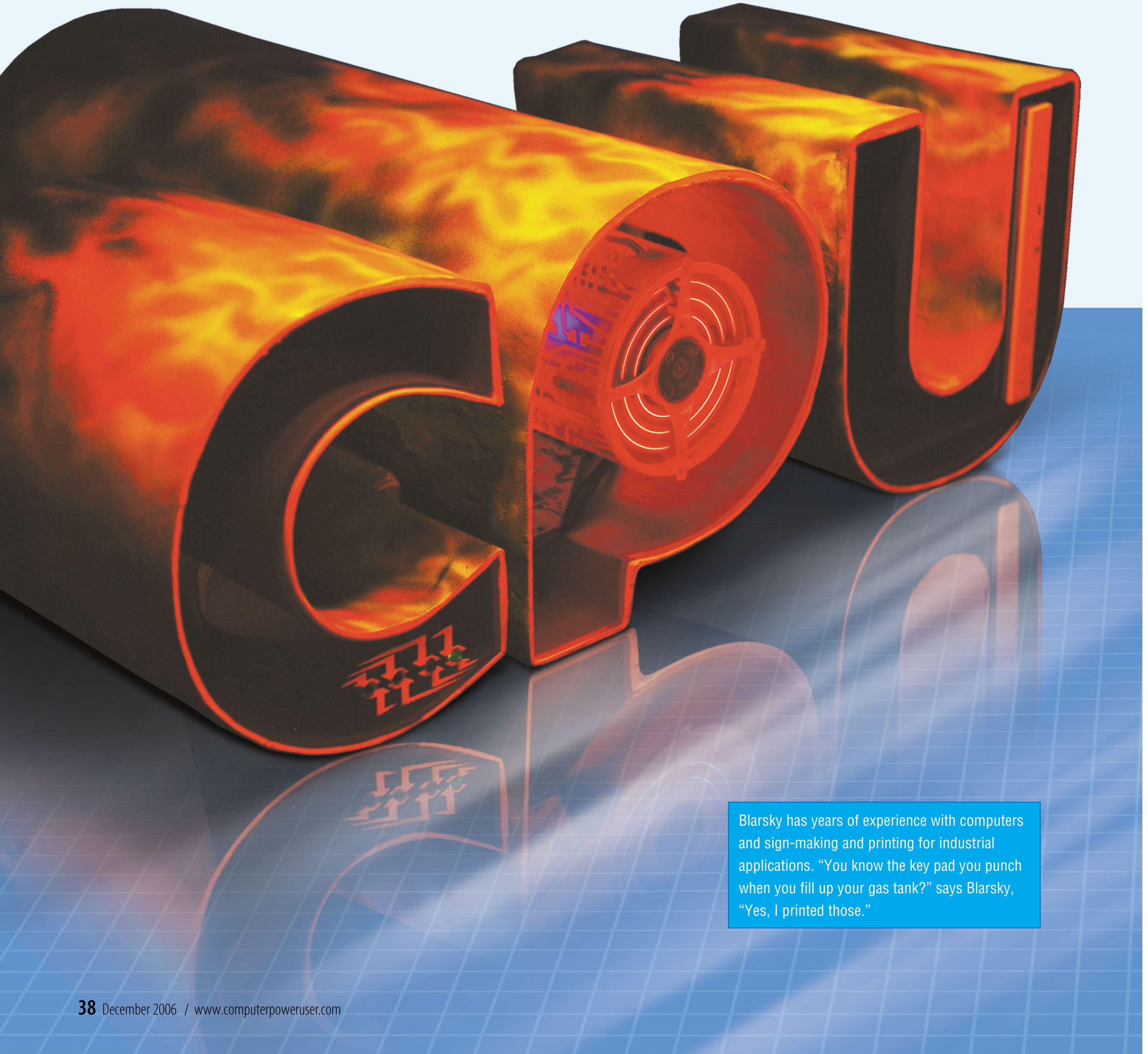
As you can see from our results below, overclocking the processor had a significant impact on performance. In the second configuration, where we raised the processor's multiplier from 13 to 14, all of the benchmark scores, with the exception of those for Sandra's memory bandwidth test, increased by approximately 9 to 12%. But in the third configuration, where almost 800MBps more memory bandwidth is available to the system, performance in all of the real-world tests increased, despite the fact that the processor was running slightly lower.

The synthetic tests show a slight drop in performance because they're more sensitive to the actual CPU frequency, but the differences are miniscule. You'll really see a difference on apps that aren't bandwidth-bound, namely games and content creation programs. In these instances, you'll be glad you had the extra bandwidth. Take a look at our F.E.A.R. and Quake 4 tests for further proof. ▲

	Stock Clock Speeds AMD Athlon 64 FX-60 at 2.6GHz Memory at 200MHz (13 x 200MHz)	**Overclocked Speeds** AMD Athlon 64 FX-60 at 2.9GHz Memory at 208MHz (14 x 208MHz)	**Tweaked & Overclocked Speeds** AMD Athlon 64 FX-60 at 2.89GHz Memory at 263MHz (11 x 263MHz)
SiSoft Sandra 2007 Pro			
Processor Arithmetic			
Dhrystone ALU	18,784MIPS	19,569MIPS	19,536MIPS
Whetstone iSSE3	15,869MFlops	16,542MFlops	16,526MFlops
Processor Multimedia			
Integer x4 aEMMX/aSSE	48,894itps	50,396itps	50,368itps
Floating-Point x4 iSSE2	52,913itps	59,963itps	59,940itps
Memory Bandwidth			
Integer Buffered iSSE2	5,994MBps	6,186MBps	6,991MBps
Floating-Point Buffered iSSE2	5,972MBps	6,146MBps	6,968MBps
LAME MT MP3 Encoding (minutes:seconds)			
Single-threaded	1:17	1:10	1:10
Multithreaded	0:50	0:46	0:45
Cinebench 2003 (seconds)			
Single-threaded	71.1	65	65.1
Multithreaded	38.1	34.1	34.1
KribiBench v1.1			
Sponge Explode Model	4.69fps	5.16fps	5.22fps
Ultra Model	1.36fps	1.51fps	1.54fps
F.E.A.R. v1.07			
Low-resolution CPU test (640 x 480, low quality)	203fps	224fps	229fps
Quake 4 v1.2			
Low-resolution CPU test (640 x 480, low quality)	155.4fps	166.4fps	178.3fps

Mad Reader MOD

There's Something Familiar About This Mod



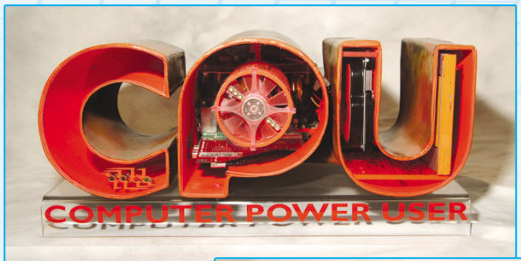
Blarsky has years of experience with computers and sign-making and printing for industrial applications. "You know the key pad you punch when you fill up your gas tank?" says Blarsky, "Yes, I printed those."

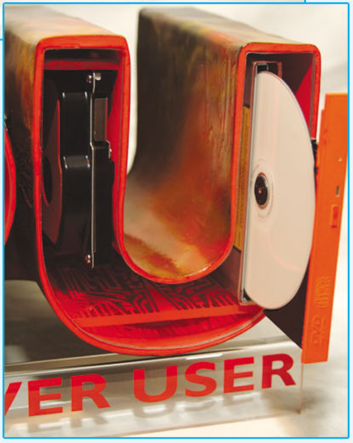
Yep, that's our logo, and it looks darn good if you ask us. But what makes this mod especially cool is that Chris "deathstarchris" Blarsky drew his inspiration as much from another Mad Reader Mod as from our masthead. Alexey Chistov's Recycle Your Computer PC-in-a-garbage-can mod (Sept. 2005 *CPU*, page 34) struck a chord with Blarsky, who has worked with boxy PC cases for years. "When I saw the trash can, I really got to thinking about my past with cases," Blarsky says. "I thought 'I really have to use all of my skills and put together a different kind of case.'"

More than 1,000 modding hours later, CPU was ready for the limelight (well, the black light, thanks to the fluorescent flame paint job). Blarsky built the CPU chassis from cardboard and then hired Forever Coatings to spray a custom coating that hardened around the cardboard. After letting the coating dry for two weeks, Blarsky spent a month sanding the entire system. Next, he airbrushed the flaming paint job . "I wanted the flames to look as though they were trailing off into the distance," says Blarsky.

Thanks to Blarsky's careful planning, the PC's components fit into the mod's letters and the extended back portion of the case—barely. He tells us that the hard drive almost touches the motherboard. The PSU also created space issues: The main motherboard cable was too long and took up too much space, and the PSU case was too blocky. Blarsky used acrylic to create a new foundation for the PSU and shortened the mobo cable to 2 inches. But the end result of all this planning, cutting, painting, and adjusting is well worth the effort: Blarsky has a stylish, rack-mountable PC that truly shows off his modding skills. ▲

by Joshua Gulick





Acrylic plates hold the optical and hard drives in place. The motherboard backs up to the U, so Blarsky had just enough room for the hard drive. In the end, he used more acrylic to keep them separated.

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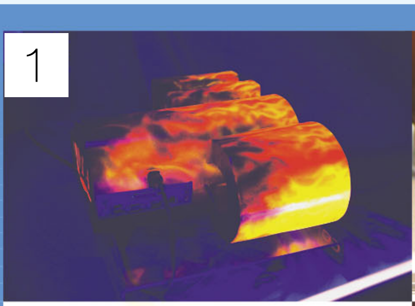

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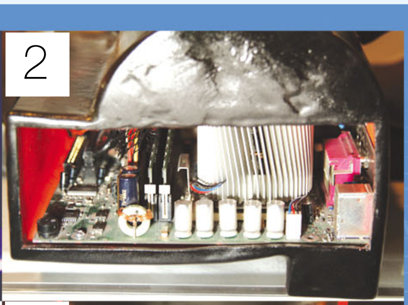

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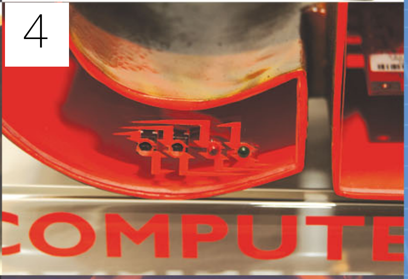

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1. The black light is key to CPU's fiery paint job. Blarsky used 1 Shot's Sign Painters 201-F Yellow Orange and 203-F Red Orange airbrush paints.
2. The motherboard secures to the floor of the system via two screws. Blarsky says he didn't need to add more because the board fits so tightly into the chassis. If you look closely, you'll see the PSU's power cables deep inside the system.
3. The system's back end houses the motherboard and PSU. Because he had to modify so many parts for this system (he even bent some of the motherboard's capacitors so the mobo fit), he doesn't expect to upgrade this PC again.
4. Flip-able power switches look cool, but Blarsky heeded the warning of other modders who said that nonmodding types found the temptation to flip the switches irresistible. These buttons are flush with the acrylic.
5. "I wanted the P oozing with light symbolizing power," says Blarsky. "The circuit print was one way in which I accomplished this. I cut out a vinyl mask using a Roland PNC 950."
6. Blarsky used a vinyl plotter to cut out the plastic back panel. He sprayed tulle material with 1 Shot paint to fill the MAD cutouts.

Give Us Your Mod

Have a computer mod that will bring tears to our eyes? Email photos and a description to madreadermod@cpumag.com. We're looking for rigs that are recognizable as PCs; your Wookiee mod won't find a home here. If we include your system in our "Mad Reader Mod" section, we'll help you load up your modder's toolbox with $1,500 and a one-year subscription to *CPU*.

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> “First, let’s face it: We PC gaming enthusiasts are pixel snobs.”

Each month we dig deep into the mailbag here at CPU *in an effort to answer your most pressing technical questions. Want some advice on your next purchase or upgrade? Have a ghost in your machine? Are BSODs making your life miserable?* CPU*’s “Advanced Q&A Corner” is here for you.*

Shane J. asked: I am stuck trying to decide what processor to use to build a video-editing machine. I really prefer AMD processors because of their price. I’ll primarily use the machine for prosumer-level video editing. Should I go with a dual-core Opteron or a dual-core Athlon? Or should I reconsider and take a look at Intel?

Intel’s Core 2 Duo family of processors has a significant clock-for-clock performance advantage over AMD’s current Athlon 64 X2 processors in virtually every significant benchmark.

A: The short answer is that you should probably reconsider and look at Intel; however, a fast AMD processor will do the trick just as well. Current dual-core Opterons and Athlon 64 X2s are virtually the same processor. The only major differences have to do with the size of their L2 cache, multiprocessor support, and their prices. If you’re buying now, we definitely think going with AMD’s socket AM2 platform would be best because AMD will eventually phase out the socket 939 platform. All socket AM2 Opterons (and the FX-62) have 1MB L2 cache per core, whereas all Athlon 64 X2s have 512KB per core. The extra cache in the Opterons will increase performance by a few percentage points at similar clock speeds, but it’s not worth the extra investment in your case. As of this writing, the 2.4GHz Athlon 64 X2 4600+ is available for about $250. A similarly clocked Opteron 1216, however, costs about $700. That’s a huge price gap for two processors that offer similar performance in most desktop applications.

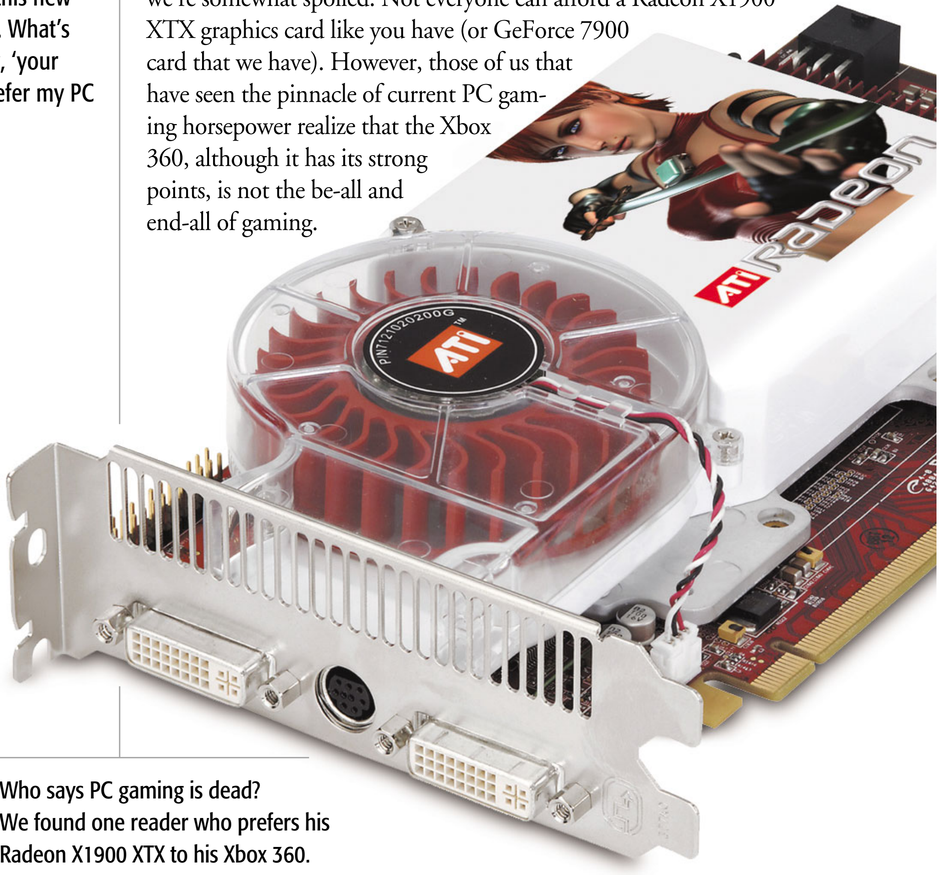
With that said, a midrange Core 2 Duo processor, such as the E6400, may be a better choice. As of now, the 2.13GHz E6400 is available for about $230. The Core 2 Duo E6400 and Athlon 64 X2 4600+ perform similarly, but the E6400 is a bit faster overall. We used our LAME MT MP3 encoding, Windows Media Encoder, and Photoshop benchmarks to test the two processors, and the Core 2 Duo E6400 came in well ahead of the Athlon 64 X2 4600+. But, in Cinebench the two CPUs were evenly matched. For $20 less, you might as well go with the faster Intel chip. Then again, because both AMD and Intel platforms use DDR2 memory, you may want to shop for your drives, memory, and motherboard first and then decide on a processor. At the high-end, the Core 2 Extreme X6800 is clearly faster than the similarly priced Athlon 64 FX-62, but at the lower price points, performance is more competitive among the competing architectures.

LG asked: I used to be a console gamer a while back, but a year ago I got the first real gaming-capable PC for my wife. I was never really into PC gaming, but after spending several sessions with the machine, I was hooked. So I decided to purchase a better video card (Radeon X800 XL). This thing is amazing!

However, everywhere I look, the reviews say that the new Xbox 360 console is a great experience. So I went out and purchased an Xbox 360, as well. After spending some quality gaming time on the Xbox 360 I didn't find this new experience all that impressive. The games look fantastic and the controller is great, but I wasn't amazed—even with the best-looking games. So I sold my Radeon X800 XL and I got the new Radeon X1900 XTX for our PC. To be honest, this new graphics card really impressed me more than my Xbox 360. What's odd is I can't find an explanation for this. All my friends say, 'your 360 is more powerful than your PC rig.' So why do I still prefer my PC gaming experience over my Xbox 360?

My specs:
ATI Radeon X1900 XTX
AMD Athlon X2 4200+
2GB RAM
2 320GB WD hard drives
Sound Blaster X-FI XtremeMusic
TV tuner
Creative I-Trigue speakers

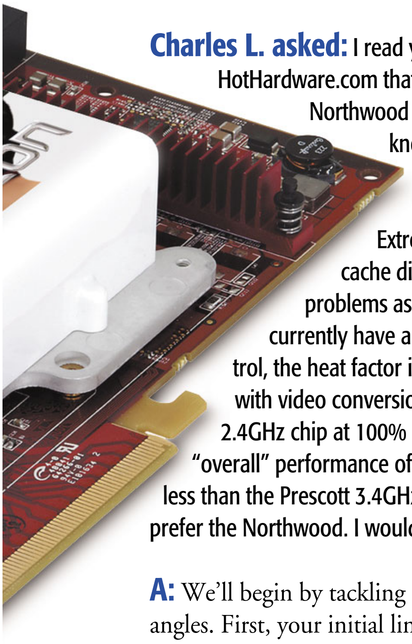
A: Although we're not interested in inciting a console vs. PC gaming debate (or flame war) with any of our console-adept *CPU* readers, we'd have to agree with your first impressions wholeheartedly, LG. Although the Xbox 360 has provided hours of entertainment both in our labs and in our living rooms, the first time we fired up the new console we were left rather flat. Obviously, when it comes to 3D graphics for the PC and PC gaming equipment in general, we're somewhat spoiled. Not everyone can afford a Radeon X1900 XTX graphics card like you have (or GeForce 7900 card that we have). However, those of us that have seen the pinnacle of current PC gaming horsepower realize that the Xbox 360, although it has its strong points, is not the be-all and end-all of gaming.



Who says PC gaming is dead? We found one reader who prefers his Radeon X1900 XTX to his Xbox 360.

First, let's face it: We PC gaming enthusiasts are pixel snobs. That's to say that we're rather comfy with our high-resolution displays at 1,600 x 1,200 and on up, along with multisample and supersample AA. The first thing you probably noticed on the Xbox 360, depending on the game title you were running at the time, was that even at high-definition settings on its outputs, the Xbox 360 doesn't really offer PC-competitive antialiasing image quality. The first time we saw a driving simulation game on the Xbox 360, the texture swimming and edge aliasing (jaggies) were a bit offensive in what were otherwise graphically impressive engines such as Project Gotham Racing or Ridge Racer 6. However, pixel shader effects between the two platforms seem to be, at least in our opinion, roughly equal.

The other problem for most folks coming from a PC gaming upbringing will be console gamepads. For example, with first-person shooters, gamepads are inherently clunky and less accurate than a mouse and keyboard. The learning curve may be steep for you here if you're used to the speed and accuracy of a laser mouse. On the flip side, for things such as racing simulations and many sports titles, the Xbox 360 gamepad is as smooth as silk. And you can't beat the convenience and dedicated functionalities of jumping on the console with virtually zero software issues and quick bootup times. But we agree with you and prefer the PC gaming experience. A high-end gaming rig still has an edge over the latest consoles currently on the market—at least in our not-so-humble opinion.



Charles L. asked: I read your excellent article from Feb. 2004 at HotHardware.com that compared the Prescott P4 3.2GHz to the Northwood Extreme P4 3.4GHz. As of today, I need to know the differences between the overall generalized performance of the Prescott 3.4GHz compared to the (standard/non-Extreme) 3.4GHz Northwood. I realize the cache differences, but I'm also aware of the thermal problems associated with all Prescotts–they're hot. I currently have a 2.4GHz Prescott, and though under control, the heat factor is apparent. My only problem is in working with video conversions and editing that quickly max out my 2.4GHz chip at 100% and take several hours to complete. If the "overall" performance of the Northwood 3.4GHz CPU is not much less than the Prescott 3.4GHz (considering the thermal factor), I would prefer the Northwood. I would greatly value your opinion.

A: We'll begin by tackling this question from a couple of different angles. First, your initial line of thinking on going with a Northwood core 3.4GHz Pentium 4 is pretty much right on the mark. A full 1GHz processor clock speed increase is going to provide you the most significant performance gain in your application and intended usage model. The additional on-chip cache that a Prescott core-based processor offers (a full 1MB cache compared to Northwood's 512KB) isn't going to offer much in the way of incremental performance gain for your system, but you're correct, Prescott is going to run a bit on the warm side comparatively. Where the Prescott core's cache might come in handy is on the gaming side of things. When it comes to media encoding, however, we've seen a 3.4GHz Northwood core fall only a couple of seconds behind a 3.4GHz Prescott P4 chip. Not to mention Prescott street prices (as of this writing) are running from $50 to $100 more than a similarly clocked Northwood core. This brings us to another perspective you might want to consider: cost.

The lowest price we could find at press time for the Pentium 4 3.4GHz Northwood core was about $185. Although this processor will definitely yield substantial performance gains for you, we would suggest you reconsider your investment and make the jump to Intel's new Core 2 Duo platform if you have the extra dollars for a new motherboard in your upgrade budget. More specifically, an Intel Core 2 Duo E6300 processor clocked at 1.86GHz only costs about $185 right now and will absolutely smoke that 3.4GHz Northwood chip, especially when it comes to encoding. Our own personal results at HotHardware.com found the 1.86GHz E6300 to be faster overall than even a Pentium D 950 dual-core chip at 3.4GHz. In short, the NetBurst Pentium architecture is dead; long live Core 2.

Marlene W. asked: I recently purchased the components to build a second system. I chose the Asus P5WD2-E Premium motherboard and purchased a Pentium Extreme Edition 965 (3.73GHz) CPU to use in it. When my son, who is a computer technician, tried to boot up the new system, all he got was a black screen and five beeps, which we found out was a processor failure error. My son contacted Asus, and one of the company's techs told him that even though it stated right on the box that it would handle that processor, our board was shipped with the wrong BIOS chip, so Asus sent us the right chip. Now the system will boot up and recognize all of the drives, etc., but after that we get a chassis intrusion error and the computer shuts down. My son tried putting the jumper on the pins to shut off the chassis intrusion feature, but to no avail; we get the same error and shut down. Do you have any suggestions, or is this just a faulty motherboard that we have? Thank you.

A: This isn't a problem that we've come across before, but we should be able to help. It seems like one of three things is happening here: Either you do actually have a defective motherboard, the new BIOS chip that AMD sent to you is for a different revision of the board, or you just need to properly reset the new BIOS chip to disable the chassis intrusion protection. Here are few things you could try before giving up and requesting an RMA for the board.

Leave the new BIOS chip installed but remove the CPU, memory, and the CMOS backup battery, and then try to power up the system. It obviously will not boot. Next shut everything back down, disconnect the power, and clear the CMOS using the onboard jumper. Wait a couple of seconds and reinstall the backup battery and CPU, connect the power, and then try to start the system again. We know this sounds a little wacky, but we've actually had issues with a couple of early Asus motherboards that wouldn't boot with a newer processor installed and simply clearing the CMOS did not help. Following this procedure will ensure that everything gets redetected and the CMOS has definitely been cleared.

If that doesn't work, and you have access to another LGA775 CPU in your first system, try putting the original BIOS chip back in the board, boot it up with the alternative CPU, and then flash the board with the latest BIOS update from Asus' site. Then put your Extreme Edition CPU back in and give it a shot. As of this writing, Asus had released a BIOS update (version 0604) that we're certain will work with the Pentium Extreme Edition 965 processor you have because we've tested it ourselves. Good luck! ▲

by Dave Altavilla and Marco Chiappetta,
the experts over at HotHardware.com

NASA's Orion

Retro Rockets, Indeed

When fashion designers or home decorators go "retro" by using ideas from the past in their current designs, they often receive praise. When designers of high-tech equipment use old-school ideas in their designs, however, people seem to have doubts: With new and improved technological discoveries, shouldn't a designer be able to create a more efficient design than what's been used in the past?

When NASA decided to use a basic, old-school exterior design for its next manned spacecraft, the Orion, critics questioned the decision. But, by borrowing the basic design elements of Apollo, the last American-manned spacecraft that landed on the moon, NASA knows it has a design that works well for extended space travel and for returning to Earth safely through the atmosphere. As a result, NASA can focus on the interior and incorporating new technologies into Orion.

NASA hasn't yet finalized all of Orion's details, but did award the Orion design, development, and build contract to Lockheed Martin in late summer 2006. Even though Orion won't begin traveling with astronauts until between 2012 and 2014, NASA has announced some of the technologies and features that Orion will include. Orion and Apollo will look similar on the outside, but they'll be vastly different spacecrafts.

NASA will continue flying the Space Shuttle until 2010, when the space agency will retire the Shuttle fleet. Orion will replace the Shuttle, providing the ability to operate in low-Earth orbit, connect to the ISS (International Space Station), and travel to the moon and Mars.

Communications Improvement

During the Apollo 11 mission in July 1969, NASA's prelaunch press materials referred to the "high-speed lines" that connected Houston's Johnson Space Center with the NASA Goddard Space Flight Center in Maryland. Such lines could carry data at speeds up to 2,400bps; a minuscule speed by today's standards.

NASA's network computers communicated with Apollo 11 several times per second, receiving and transmitting data and commands. Such data traveled via UHF (ultra high frequency) radio signals at speeds up to 1,200 bits per second.

To track Apollo 11, NASA used two different-sized antennas (30 feet and 85 feet in diameter) that were installed at several land-based locations and on tracking ships around the globe. The antennas passed data

Apollo's Computing Hardware

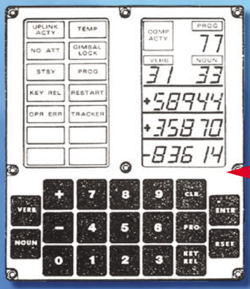
Not surprisingly, the computing hardware and software aboard the Apollo 11 in 1969 differs greatly from computers in use on the Space Shuttle today and from what Lockheed Martin will use in Orion.

Keep in mind that even though the power of Apollo's onboard computer is almost laughable compared to the lowliest PDA on store shelves today, it represented top-of-the-line technology of the mid-1960s. (Because of the complexity of the Apollo project and the need for NASA to finish portions of it a few years ahead of the launch date, engineers couldn't include some newer technologies in the computers available by the launch.)

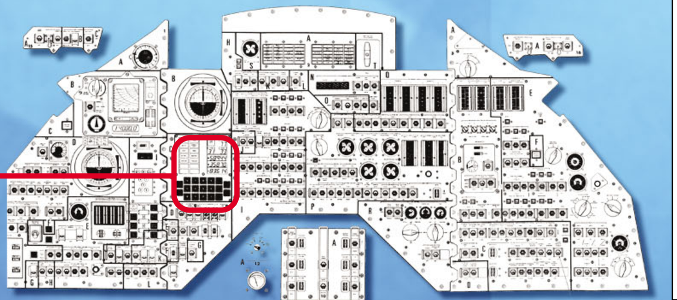
For the Apollo hardware, MIT designed the AGCs (Apollo Guidance Computers) and Raytheon built them. Apollo used two identical computers: one in the CM (Command Module) and one in the LM (Lunar Module). Astronauts accessed these computers through a DSKY (Display/Keyboard; 8 x 8 x 7 inches [HxWxD]) located within the main control panel. The software was extremely limited, only letting astronauts enter number codes to execute commands.

The final amount of memory in Apollo 11 was eight to 10 times more than MIT originally planned in the early 1960s. Despite the increase in memory, software development problems still existed. Then again, the idea of "software development" was largely undefined until projects such as Apollo demanded improved software techniques. For example, engineers had to complete software several months before construction of the fixed memory, allowing for the time-consuming process of building the fixed memory. Also, once the fixed memory was completed, NASA didn't allow any changes to the software. ▲

Apollo Display & Keyboard



Apollo Command Module Main Control Panel



Apollo Guidance Computer

Dimensions: 24 x 12.5 x 6 inches (HxWxD)

Weight: 70 pounds

Power requirement: 70W at 28V DC (standby: 15W)

Computer circuitry: About 4,000 integrated circuits

Clock: 1MHz

Fixed memory: 36K words*

Erasable memory: 2K words*

Final cost: Unknown, although Raytheon's cost overruns were high, in part, because of changes in memory demands

**A word was equal to 16 bits (consisting of 14 storage bits, 1 sign bit, and 1 parity bit)*

Sources: NASA, Dr. Dobb's Portal

back to NASA computers through a network of landlines, undersea cables, radio circuits, and satellites; NASA called the network its "two-million mile hookup."

With the earliest Space Shuttle flights in the early 1980s, however, NASA greatly improved its communications network. Data moved across the worldwide network at speeds of about 128Kbps, about 10 times the speed of the past Apollo missions. And with today's Shuttle flights NASA uses its three TDRSs (Tracking and Data Relay Satellites) to communicate with the spacecraft at speeds up to 3Mbps.

Technology Advancements

By the time Orion launches in several years, technology obviously will be far more advanced than what's been available for the Space Shuttle missions in the past few years. Such advances mean the eventual computing and communications technologies that appear in Orion will be far different than what the Shuttle uses. Finding ways to incorporate these advances in technology while meeting numerous deadlines for the design and construction of Orion and staying within budget constraints will be challenging for NASA. Although, such difficulties shouldn't be a surprise—after all, we are talking about rocket science here. ▲

by Kyle Schurman

Command Modules: Apollo vs. Orion

The Apollo CM (Command Module) could carry three astronauts to the moon and back to Earth. During each of the Apollo moon landing missions, two astronauts (Neil Armstrong and Edwin "Buzz" Aldrin on the first moon landing) flew the LM (Lunar Module) to the moon's surface, while the third astronaut (Michael Collins) remained in orbit around it in the CM.

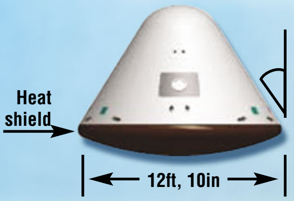
A SM (Service Module) connected to the CM and carried supplies. (NASA often referred to the combined Command and Service Modules as the CSM.) The astronauts jettisoned the LM after returning to the CM from the moon's surface and the SM just before re-entry into the Earth's atmosphere. (Orion also will use an LM and SM.)

Because Orion will serve as America's only spacecraft for human missions for a 20-to-30-year period following its introduction, NASA needed Lockheed Martin to design it with the idea that it would perform two key functions: First, operate in low-Earth orbit and connect to the ISS (International Space Station), and, second, make trips to the moon and Mars and work well for extended stays in space. Engineers eventually settled on a design model similar to Apollo, using a cone-shaped CM and an LM to descend to the moon's surface. However, there will be several important differences, including improvements in safety, technology, and design.

For instance, the Orion CM will be larger than Apollo's CM, letting four to six astronauts travel aboard it. Also, unlike the Apollo CM, which required astronauts to land in the ocean, the Orion CM will be able to land on the ground (although an ocean landing is possible if needed). By avoiding a seawater splashdown, recovery of the Orion CM will be easier and more cost effective than recovery of the Apollo CM. Also, NASA plans to reuse many components of the Orion CM in future missions; seawater caused serious corrosion problems with the Apollo CM that prevented it from recycling components.

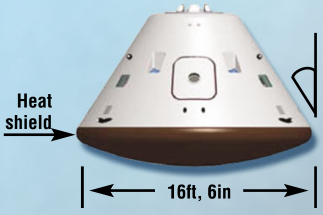
Although it may appear as if NASA is taking a step backward by returning to the cone-shaped Apollo design for Orion (vs. using a Shuttle-shaped spacecraft), but the cone-shaped CM makes the most sense for trips to the moon and beyond. In the design of both Apollo and Orion, the SM protects the heat shield on the cone-shaped CM throughout the flight. On a plane-shaped spacecraft, however, the heat shield is subject to collisions and damage throughout the flight. Also, a spacecraft must exceed 17,500mph to escape Earth's gravity. Spacecraft returning from the moon enter Earth's atmosphere at about 25,000mph, which requires a powerful heat shield. On a plane-shaped design like the Shuttle, engineers can't create a heat shield and structural design for the wing area that can withstand a 25,000mph re-entry, but the cone-shaped CM of the Apollo and Orion is more aerodynamically stable for re-entry at this speed. ▲

Apollo CM



Height: 11 feet, 5 inches
Diameter (base): 12 feet, 10 inches
Side wall angle: 32 degrees
Weight: 12,250 pounds
Habitable volume: 210 cubic feet
Maximum crew: 3

Orion CM (projected)



Height: 10 feet, 10 inches
Diameter (base): 16 feet, 6 inches
Side wall angle: 32.5 degrees
Weight: 17,396.8 pounds
Habitable volume: 361 cubic feet
Maximum crew: 4 (with ability to expand to 6 for Mars missions)

Source: NASA

A Glass Cockpit For Orion

Orion's cockpit will include MEDS (Multifunction Electronic Display System) technology, also known as a glass cockpit. As you can see from these Space Shuttle photos, an older cockpit without MEDS (top) is vastly different from a cockpit with MEDS technology (bottom). NASA used MEDS for the first time in the Space Shuttle Atlantis for its May 2000 mission. By replacing numerous gauges and CRT displays with full-color, flat-panel displays the MEDS system uses, NASA made the Atlantis cockpit 75 pounds lighter and gave its pilots far more and easier-to-understand information they could customize than was available during previous flights. This technological advance has helped pilots focus on the most pertinent information during space travel.

Today, most modern airplanes use glass cockpit systems, as well as the Space Shuttle fleet. By the time the Orion fleet is ready for flight in several years, additional improvements to the glass cockpit/MEDS system undoubtedly will occur. ▲

Sources: NASA, NASA Ames Research Center, Wikipedia

4x4

AMD Takes Aim At The Enthusiast Market

For most people, four-wheel drive vehicles (4x4s) probably are overkill. Sure, there are professions, such as farming or construction, where driving through rough terrain is necessary. And some people camp or hike in difficult-to-reach locations. But if the only time your 4x4 vehicle goes "off-road" is when your teenager misses the driveway and catches the edge of the lawn while learning to drive, you could probably live without 4x4 capabilities. At that point, 4x4 becomes more of a status symbol than a functional feature.

Thanks to AMD, the computing industry soon should have its own version of 4x4. It remains to be seen, however, whether AMD's 4x4 will be a necessary technology or overkill.

Introducing 4x4

AMD is aiming its 4x4 platform at computing enthusiasts. The platform will consist of two dual-core CPUs (the first 4) and two graphics cards containing dual-core GPUs (the second 4). The second 4 could also refer to the number of hard drives or the 4GB of memory included with the typical system.

AMD announced plans for 4x4 this past summer. Officials at AMD also say that the idea of 4x4 appeared as a response to future multithreaded games that will take advantage of multicore CPUs and GPUs.

Although AMD couldn't give us specifics about the release of 4x4 before

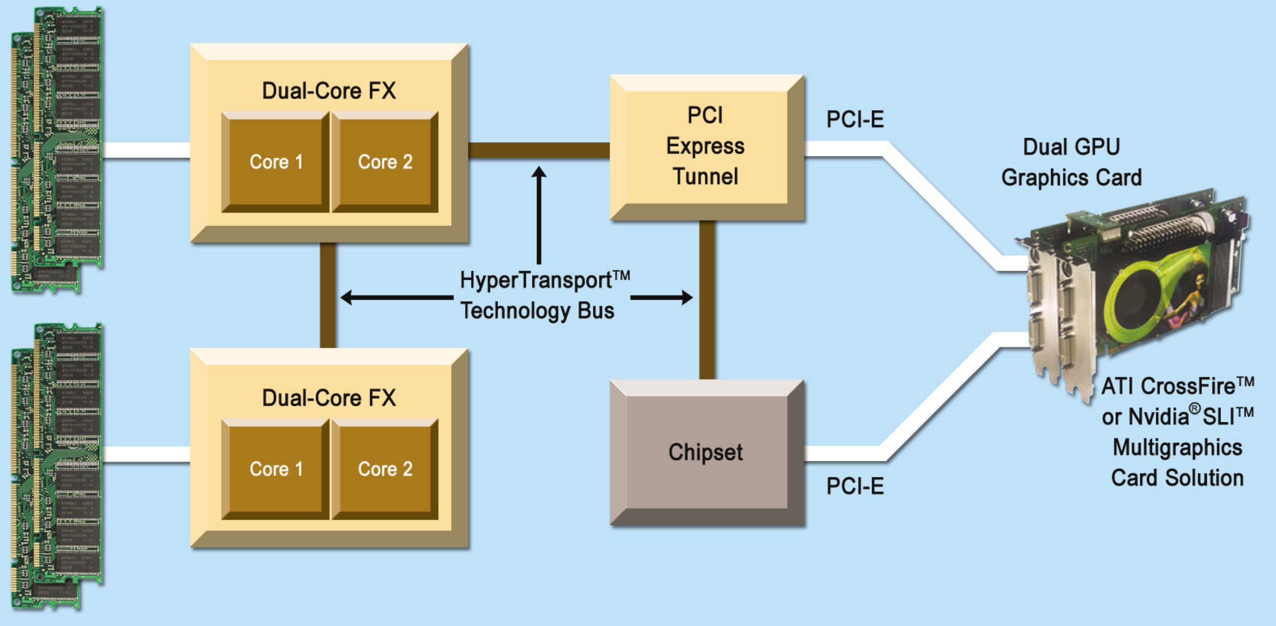
The Architecture Of AMD's 4x4

In its upcoming 4x4 platform, AMD is using its HyperTransport technology to provide high-bandwidth buses between the CPU chips and connect the chips with PCI-Express components such as the graphics cards. The 4x4 platform will differ from dual-Opteron CPU setups because it will use unbuffered DDR2 memory. Each CPU core will have a dedicated channel to the system memory, and each CPU chip will have two DIMM slots.

AMD indicated in its initial announcement that 4x4 will be expandable, meaning perhaps that a user could at first purchase a 4x4 system that contains one dual-core CPU and then add a second dual-core CPU later. Or later the user could swap out his dual-core CPUs in favor of quad-core chips.

Although AMD hasn't released many official details concerning 4x4, it did give a brief demonstration this past July of a working a 4x4 system, showcasing the platform's ability to "megatask," such as playing games while encoding video and audio. The first dual-core CPUs will most likely be FX-70 (2.6GHz), FX-72 (2.8GHz), and FX-74 (3GHz) models, and they'll use Socket 1207 (also called Socket F).

Finally, AMD's 4x4 will work with either Nvidia or ATI graphics cards. (However, because AMD announced plans this past summer to acquire ATI, we won't be surprised if ATI graphics cards become the preferred equipment for 4x4 in the near future.) ▲



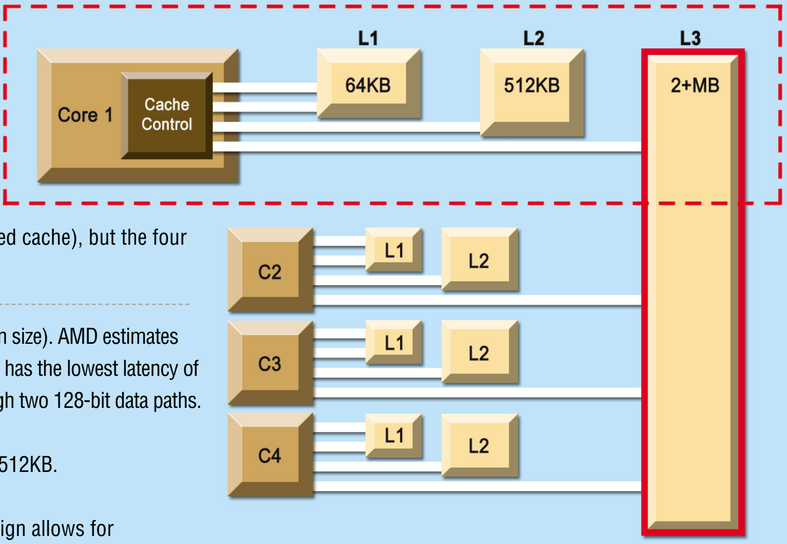
Sources: AMD, Tweakers.com

we went to press, AMD spokesperson Damon Muzny says 4x4 products still should be available as AMD originally planned: by late 2006 (in time for the holiday season). The company also expects that at least some 4x4 CPU kits will cost less than $1,000; however, overall system costs remain unknown. Some of the high-end CPU kits could cost as

Quad-Core, Single L3 Cache

In the quad-core systems, each core will contain cache control technology. AMD says its cache control technology will work well with onboard memory controllers, giving their cache areas improved overall performance and efficiency without the need to greatly increase the amount of memory each cache contains.

The quad-core system will use three cache areas. Each core will have its own individual L1 and L2 caches (dedicated cache), but the four cores will share an L3 cache. ▲



L1. Most of the critical data will remain in the L1 cache (64KB in size). AMD estimates about 95% of the core's cache hits will involve L1 cache, which has the lowest latency of the three cache areas. Each core can access its L1 cache through two 128-bit data paths.

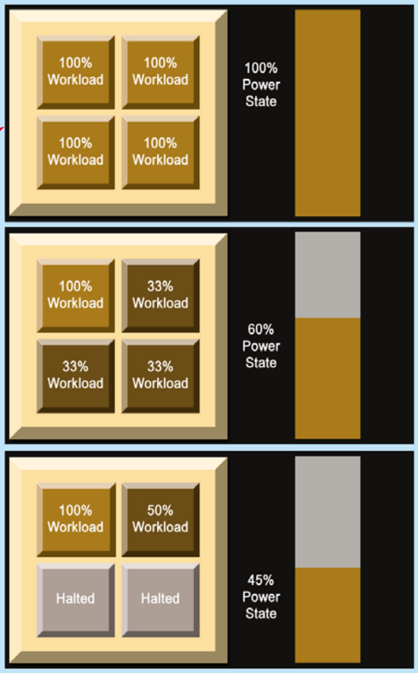
L2. Each core has its own dedicated L2 cache, consisting of 512KB.

L3. The shared L3 cache will be about 2MB, but AMD's design allows for expansion in the future. The L3 cache will be great for using shared data in multithreaded applications.

Sources: AMD

DICE Brings Power Efficiency

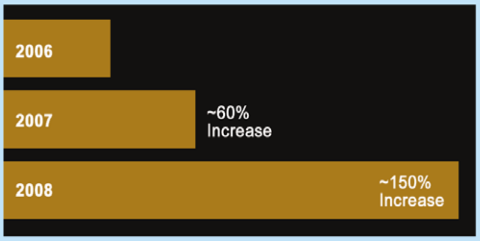
AMD's DICE (Dynamic Independent Core Engagement) technology will let its quad-core setups use power more efficiently. DICE will adjust the core frequencies for each individual core, letting the core meet its workload without wasting any power. Each core contains its own PLL (phase-locked loop), controlling its clock frequencies, which is important in DICE technology. ▲



All four cores are working at 100%, meaning the power consumption also is 100%.

To utilize power more efficiently, the AMD system uses DICE. The system operates one core at full workload, while giving the other cores an even workload.

The system is able to shut down two cores while splitting the workload between the other two cores, which improves power efficiency. (Essentially, the quad-core CPU can become a dual-core CPU when a user needs it, conserving power.)



AMD expects its various quad-core technologies, such as DICE, will greatly increase the performance per watt for its CPUs. Compared to the performance per watt for its CPUs in 2006, AMD CPUs should gain 60% more performance per watt by 2007 and 150% more by 2008. Performance-per-watt numbers will be especially important for quad-core setups in mobile devices and notebooks.

Sources: AMD

much as $1,500, and that's before adding hardware for four memory slots and two graphics cards.

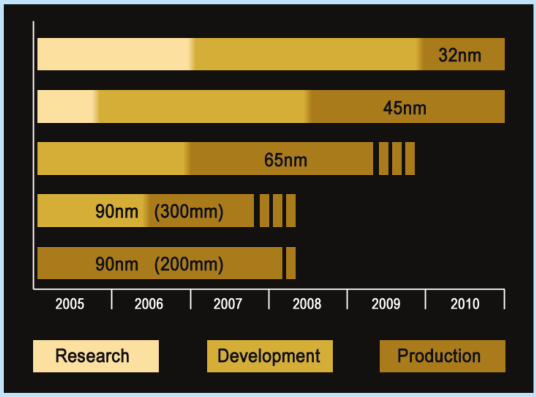
AMD says the motherboards it will use with 4x4 will be "tweakable," meaning a user will be able to upgrade and scale them, which may save some money initially. For example, a user will likely be able to replace his dual-core CPUs with quad-core CPUs sometime in 2007. It's also very possible that AMD may offer its 4x4 technology and hardware directly to the enthusiast market, letting a power user build and tweak his own system based on the 4x4 platform, which, again, could save money vs. buying a preconfigured system.

Overkill Or Necessity?

As with any new hardware platform, the ultimate question about whether it will be successful hinges on whether software applications can take advantage of the hardware's capabilities. After all, why purchase all of the computing power that's

AMD Desktop Technology Timeline

	2006	2007	2008
Processors	AMD virtualization and security, DDR2 Energy Efficient 90nm→65nm	Next-generation core Larger Caches HyperTransport™ 3.0	Core update Larger caches HyperTransport 3.0
Performance	4x4 Dual-processor Dual-core Multicard graphics	4x4+ Dual-processor Quad-core Multicard graphics	4x4++ Dual-processor Quad-core, DDR3 Multicard graphics
	Dual-core, DDR2 AMD virtualization and security Vista® capable	Quad-core HyperTransport 3.0 Vista® ready	Quad-core, DDR3 HyperTransport 3.0 PCI-E Gen II
Mainstream Stable Platform	CSIP Managed Platform	Dual-core HyperTransport 3.0 Vista® ready	Dual-core, DDR3 HyperTransport 3.0 PCI-E Gen II



As you can see from the projected timeline above, 4x4 technology should migrate from dual-core, dual-processor systems to quad-core, dual-processor systems during 2007, as marked by the "4x4+" moniker in 2007 in this timeline. (There's no word on what the "4x4++" moniker in 2008 specifically means, though.)

The chart on the left shows how AMD's CPU manufacturing process will continue to migrate, moving from 90 to 65nm by late 2006 and to 45nm by 2008. (The initial 4x4 platform CPUs likely will use 90nm manufacturing.) AMD already has begun using 300mm silicon wafers, rather than the 200mm wafers it's been using.

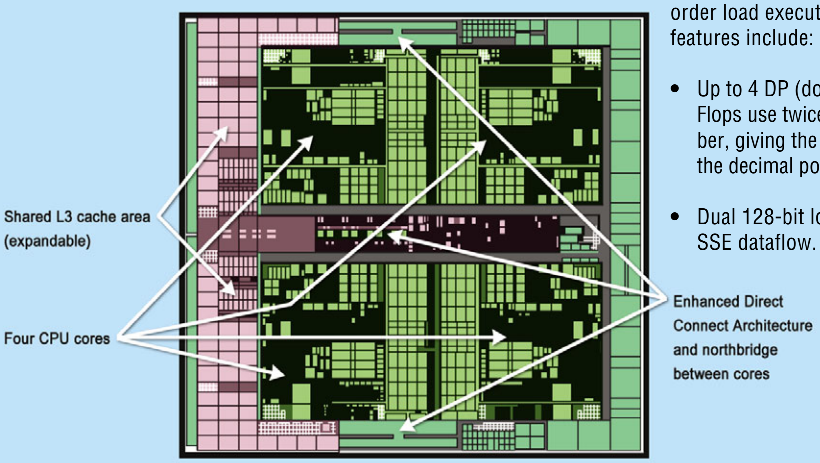
Sources: AMD

Quad-Core Die

AMD's 4x4 technology will use dual-core dies; however, it eventually could migrate to a quad-core die. AMD has designed the quad-core die to work with 65nm manufacturing technology, but it should also work well with 45nm manufacturing in the future.

The quad-core CPU uses enhanced branch prediction and out-of-order load execution to improve overall performance. Other features include:

- Up to 4 DP (double precision) Flops per cycle. (The double-precision Flops use twice as many bits as a single-precision floating-point number, giving the DP floating-point number far more digits to the right of the decimal point, allowing for more precision.)
- Dual 128-bit loads per cycle that feed into a dual 128-bit SSE dataflow.


Shared L3 cache area (expandable)
Four CPU cores
Enhanced Direct Connect Architecture and northbridge between cores

Also, the quad-core die uses Direct Connect Architecture technology, enhanced power management technology, and enhanced RAS features. Eventually the quad-core die will include support for DDR3, but at first it will use DDR2 memory. ▲

Sources: AMD

available in a 4x4 platform if there are no games or other applications that can take full advantage of it? Multithreaded games and applications eventually will catch up to the high-powered hardware, but how long will users buying the first 4x4 systems need to wait for software?

Then again, maybe software availability won't be a huge factor in 4x4's success. AMD says it's aiming 4x4 at high-end gamers, but also at those enthusiasts who take multitasking to the level of "megatasking" (AMD's term for extreme multitasking). The powerful CPUs and GPUs can help a user run multiple programs—even those that require high-end hardware capabilities—with very few problems. Megataskers won't necessarily care that multithreaded software isn't available right away; they may want 4x4 systems to help them perform more tasks simultaneously and more efficiently. "For whatever reason, they need more power," Muzny says. "There are some folks out there that do over-the-top work. They've been looking to AMD. We've taken a cue from those guys doing megatasking and borrowed some tricks from Opteron [in creating 4x4]."

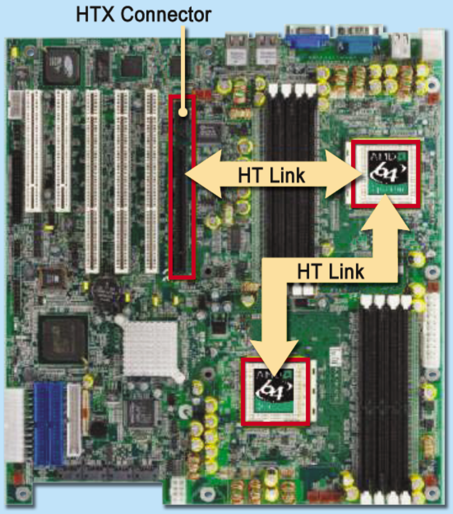
As more applications and games appear to take advantage of the multicore CPUs and GPUs, those already using 4x4 will be ahead of the game. Later, 4x4 users can continue to add more power and chips to their systems, as necessary. "We want to create a product that's enthusiast-friendly and deliver it in a form factor that's SLI-friendly and that's gaming-friendly," Muzny says. "We're just playing to our architectural strengths in trying to deliver a platform that will scale. Today, it's dual-core with two sockets. Tomorrow—that is, next year—it's quad-core with two sockets."

As we all know, PC enthusiasts are good at finding ways to use the hardware power they're given. And software makers are good at creating new features to eventually reach the hardware's capabilities. It appears 4x4 could be the kind of platform that will appeal both to those who *need* expanded power and multithreading and those who *want* to have the power available, even if they'll rarely be able to take full advantage of it right away.

After all, nobody says you *must* take your 4x4 SUV off-road to enjoy it, but it's comforting to know you at least have the capability. ▲

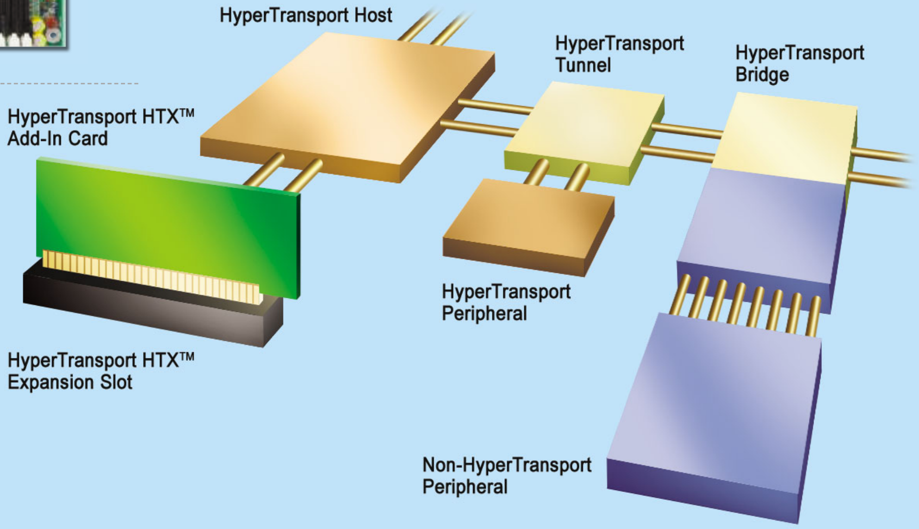
by Kyle Schurman

HTX Extends HyperTransport's Reach



Scheduled for release in 2007, AMD will use HTX technology in its Torrenza technology, and HTX could appear in the 4x4 platform in the future, too. Peripheral devices that don't normally contain HT capabilities will get HyperTransport technology with HTX connectivity.

HTX will use an expansion slot to expand HT's high bandwidth and low latency to a subsystem or peripheral device located on an HTX expansion card. The HTX slot will use an HT link for high-bandwidth, low-latency connectivity with one of the CPU cores in a multicore system. ▲


HyperTransport Host
HyperTransport Tunnel
HyperTransport Bridge
HyperTransport HTX™ Add-In Card
HyperTransport Peripheral
HyperTransport HTX™ Expansion Slot
Non-HyperTransport Peripheral

HT technology brings high-bandwidth connections between key components such as the CPU and memory. The wider yellow connectors represent high-bandwidth connections (6.4GBps). Non-HT peripherals use lower-bandwidth connections (thinner yellow connectors).

Sources: AMD, HyperTransport Consortium

SERVERAMA

Think Outside The Desktop

True power users don't just build PCs—they build servers. Imagine having instant access to files and programs from any PC on your network without having to store all of that data locally on each machine. Or, imagine throwing a LAN party where there's a computer dedicated to offloading as much as possible from everyone else's machines and keeping the network running smoothly to help increase the frag count. You can host your own Web site or email server, give yourself access to files from any location on the planet that has Web access using an FTP server, or do any number of things, and it's easier and cheaper than you might think.

Add It Up

You can often build a server using spare parts or a PC leftover after you upgrade. For most types of servers, performance isn't as critical as it is with a desktop PC, so you can save money by purchasing older or used components. After the initial configuration is complete, you may simply plug in your server(s) and leave it alone, so you may not even need a dedicated monitor for it, and depending on placement, you can always plug it into a secondary port on your existing desktop monitor to eliminate that expense. You'll need an operating system, which for most people will mean licensing some flavor of Windows just for the sake of convenience. Using a free or low-cost Linux distribution is a good way to cut costs, but only if the applications you want to use on your server are compatible with Linux. You also must consider the cost of those applications, although there are plenty of free server tools out there regardless of the OS you choose.

Servers may be inexpensive to build, but they aren't necessarily cheap to run. Total power draw is a major consideration when building a server that's designed to remain on all the time, especially when operating a file server that uses multiple hard drives configured to take advantage of RAID. Of course, you'll want connect the server to a UPS, and proper cooling is of major importance because server CPUs, hard drives, and other heat-generating components tend to remain on longer and work harder than similar hardware does in a desktop PC. All of the tricks that you use to ensure proper airflow and heat dissipation throughout the case when building a gaming rig apply doubly to a server, and you should consider watercooling or massive heatsinks whenever possible to improve cooling while reducing noise levels.

Avoid The Crackdown

If you plan to build a Web server, FTP server, or some other type of server that requires incoming and outgoing Internet access, be sure to check with your ISP to make sure running a server from home is kosher. It often isn't, and you may need to upgrade to a business-class broadband account or risk having your ISP terminate your access if it detects a server running on your consumer account.

You should also be careful when setting up something like a Tor server (tor.eff.org), which is designed to help people maintain their privacy on the Web, particularly if it's an exit node that transmits the original user's request in the clear to the destination server instead of transmitting it over an encrypted link. If a request results in illegal material going back to the original requester in this type of setup, your server's IP address is the only one that's associated with downloading that material. This may result in the authorities seizing your server (as happened in Germany on Sept. 11, 2006, when several Tor exit nodes were taken as evidence in a massive child pornography sting) and other bad things, so know what you're getting into when you participate in these types of server-driven services.

Name Your Poison

No matter what type of server you want to run, there's likely an article on how to put it all together in the sections that follow. Also, keep in mind that if you don't see an article that specifically applies to your situation, the setup process for nearly every type of server is quite similar, so most of the initial preparation steps and tips should still be of use and then you can use the documentation for the applications you're using to finish the installation. Much of what you need is probably already sitting around, so why not dust it off and give it a shot? ▲

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by Tracy Baker

52 YOUR GATEWAY TO THE WORLD
What You Need To Build Your Own Web/Email/FTP/Game Server

60 ONE FOR ALL
Build A LAN/Media Server

65 GAME ON
Build A Dedicated Game Server

YOUR GATEWAY TO THE WORLD

What You Need To Build Your Own Web/Email/FTP/Game Server

When most of us hear the word "server," we probably think of a computer (or a whole bunch of them) that costs thousands of dollars, sitting in a dark room running Amazon.com or something equally massive. The truth is a little more diverse than that: Yes, there are servers that earn the term "big iron," but there are just as many that are more modest—and that individuals and home office folks have created and used. The idea of a personal server is no longer as daunting as it used to be, thanks to the general democratizing of the computer world.

How do you create such a thing, though, and what's it really good for? That's what this article is all about: why you might want a server, what you'll have to do to set one up, and what you need to do to keep it in top condition.

At Your Service

Many of the common uses for a personal server are smaller versions of what full-fledged business servers do. The following quick rundown lists some possibilities you can do with a personal server.

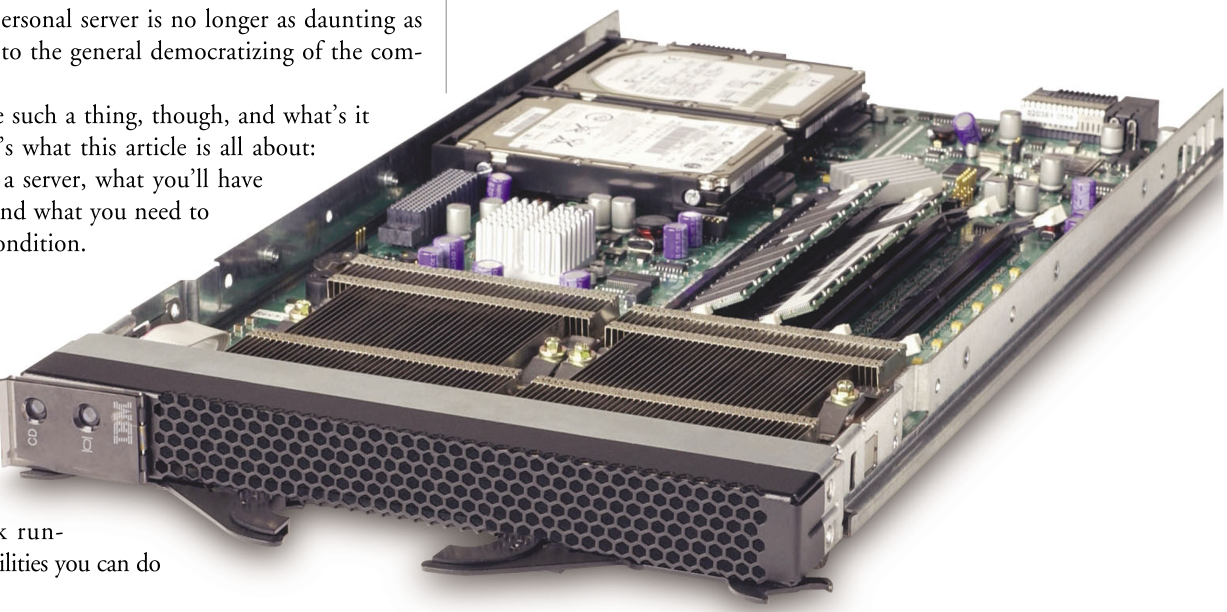
Network sharing and filtering. A server can work as a firewall and network sharing device. If you've used a standalone router and grown frustrated with its limitations (such as a lack of upgradeability), this is one way to work around that.

File storage. Having a common place to deposit files that are used by many people at once is another enormously common use for a personal server. You could create an in-house multimedia repository or a public FTP server where people can upload or download files from the Internet at large.

Device sharing. Attaching printers, scanners, and other devices to share over a network is another common server chore.

Email. A server can act as a giant email storehouse for a number of people. For the extremely organized, you can add conferencing and calendaring functions for a total package.

Web hosting. Most of the time, you can buy Web hosting without having to actually set a server aside for it. But if you want



A blade server, such as this one from IBM, condenses a whole PC's worth of components into a rack-mountable package; they're perfect for a home setup or remote hosting.

Dell's entry-level PowerEdge servers are some of the most commonplace and inexpensive server-class computers.

absolute control of the box, or if you want to start there and eventually create something more ambitious, there are plenty of reasons to dedicate a whole server to it.

Dedicated application hosting. If you're creating a Web site that isn't just static pages, you might need to build something that runs a specific application, such as a content management server. Maybe you're trying to create something genuinely new from the ground up, like a social networking site, where you need tons of dedicated disk space and bandwidth that you can't get through a shared plan.

Game server hosting. Game servers are, in a sense, running a dedicated application, even though the app in question isn't a business application. There are many examples of Counter-Strike: Source-, Battlefield 2-, and Halo-dedicated game servers.

Step 1: Educate Yourself

Setting up a server requires a better understanding of what you're doing than setting up a desktop computer. Most desktop PCs are designed to be uncrated,

Know Your Network Connection

Before you set up a server in your home or office that others from the outside world can access, look into your ISP's terms of service about such things. Hosting a server from your household Internet connection may be explicitly disallowed; many ISPs block ports 25 and 80 (outgoing email and WWW servers, respectively) to prevent people from burning up inordinate amounts of bandwidth on a service plan that's not rated for such things. It's one thing if you're using a business-level account and have specific permission to host a server, but most personal Internet connections do not allow this. Some ISPs may even revoke your service if you attempt to use your home's Internet connection to host a server. ▲

booted up, and put right to work; a server typically needs a lot more user guidance and intervention. If you have a local guru or know someone else who has attempted something similar, talk to them about the experience. Learning from others' success and setbacks is often less risky (not to mention expensive) than trial and error.

Most server applications will run smoothly if you set up an existing component of the OS or add software which usually costs little or nothing. For instance, if you wanted to create a standalone firewall box, one common way to do this on a small budget is to obtain a dedicated Linux distribution that focuses on such things and will continue to operate without extensive user intervention.

Some server applications for Windows are written specifically for a server edition of Windows. Microsoft Exchange, for instance, is one such program. It's not compatible with Windows XP Home or Professional, just Windows Server (2000 or 2003). Others, like the Mercury/32 mail server, can run on any 32-bit edition of Windows; the program's manufacturer will be able to tell you which, if any, specific version of Windows you'll need.

Step 2: Lin Or Win?

You can't discuss setting up a server without inevitably discussing what OS the server should use, and the two major choices often wind up being Windows and Linux. Your choice is probably going to be predicated by the following two things: how much you can spend and your level of experience with the respective OSes.

If you already have experience with Linux in some form, you'll be more comfortable with using it as a server OS, and you may be able to save some money. One of the advantages to using Linux is not only its low cost—most distributions are free and of high quality—but also something mentioned earlier: the broad variety of application-specific distributions. For example, you can get a Linux distribution that works "out of the box" as a firewall or network sharing device.

Many of these distributions work as a Live CD. They're available as an ISO disc image, and once you burn the image to a CD, you can boot and run Linux directly from the CD without having to install anything to a hard drive. This makes them easy to try out provisionally. (For even more convenient testing, try mounting the disc image to run in a free virtual computer environment, such as Virtual PC or VMware.)

Software

The number of software packages out there that accomplish a particular task, let alone the dozens that servers routinely do, would fill a book several times the size of this magazine. Instead, we'll zero in on many of the most common server applications and discuss how they're incarnated in different programs.

Network sharing. Windows has the Internet Connection Sharing feature; with Linux, there are whole editions of the OS that work as standalone routers. IPCop Firewall (www.ipcop.org) and Smoothwall (www.smoothwall.org) are two of the most popular, and both have bootable ISO CD images for quick setup. FreeBSD router distro m0n0wall (m0n0.ch/wall) stores its entire system configuration in a readable XML file.

Email. Linux has SMTP and POP3 mail as part of its OS, although different distributions contain different management interfaces. Microsoft offers Exchange Server as its main mail product, but its cost and scope make it more suited to companies rather than individuals. For people who want something more modest and inexpensive, our vote goes to either the native SMTP/POP3 mail in Windows Server 2003 or the freeware Mercury/32 (www.pmail.com), which runs on any 32-bit edition of Windows.

If you're looking for a solution that includes scheduling and appointments in Linux, a product like Open-Xchange (www.open-xchange.org) might do the trick; for both platforms, there's phpGroupWare (www.phpgroupware.org).

FTP. Linux supports FTP out of the box, as does Windows Server. For non-Server versions of Windows, consider FileZilla (sourceforge.net/projects/filezilla), an open-source project that has both client and server incarnations.

File sharing. Both OSes have built-in mechanisms for sharing files and folders, although each comes with some caveats. If you share out a folder in a non-Server version of Windows XP Professional, there's a limit of 10 inbound connections, although in most home or small-office scenarios, this isn't too big of a problem. Linux can share files and folders to Windows clients through the Samba (www.samba.org) package, included by default in most distros.

WWW. Server editions of Windows come with Internet Information Services; Apache (www.apache.org) is the Web server of choice in Linux and comes bundled with most distributions. However, you can also download Apache and run it in any 32-bit Windows OS. Because Apache is usually used in conjunction with the MySQL database and Perl or Python scripting/reporting languages, there's at least one distribution of Apache for Windows that includes all of the above in one package—The Uniform Server (www.uniformserver.com). This is a great way to set everything up with minimal effort and confusion, because it's built from the ground up to run as a production server and installs very cleanly.

Web applications. This is a general term for any application that uses a Web server, and in turn, a Web browser, as its interface. Examples of such an application could be the aforementioned phpGroupWare product or a Web-based content management system such as Movable Type (www.sixapart.com). A shared server is probably the most commonly used server for Web hosting, but all Web applications run more smoothly on a dedicated server. Using Web applications will put a bit more of a demand on your server's CPU and RAM than simple file sharing or serving static Web pages.

Keep in mind that whenever you're dealing with a Web-based application, there's a very good chance you'll have to learn at least the rudiments of whatever programming language developers used to write the application. For instance, Movable Type, primarily a Perl-written package, doesn't require a sweeping understanding of Perl, but you should know enough to troubleshoot it if you ever hit any snags. The more you know, the better equipped you'll be to handle not only how to get things started but also how things will evolve. ▲

If you're more familiar with Windows, it'll be easier to use than Linux, even if Windows as a server OS isn't quite the same as Windows as a desktop OS. But it will cost you a bit more, especially if you plan to run applications that require a Windows server OS. Also, if you share a printer or other device across the network through the server, it's slightly more complicated to share a printer or similar device in a mixed environment—a Linux server with individual Windows PCs, or vice versa—than an exclusive Windows environment, but it is possible.

Drivers are another issue. For example, some printers have Windows-only drivers, which will essentially force you to share them from a Windows machine. Linux systems can use the Berkeley LPR/LPD print spoolers, and Windows can talk to them easily. Also, many manufacturers are gradually adding Linux support to their peripherals.

However, the choice of applications (or at least applications that do specific tasks) that can run on both is almost identical. For instance, anything written in Perl or that uses MySQL as a backend database (which might be the case with a Web-based application) will work in either system almost identically. There are a few gotchas, though. Windows doesn't apply case-sensitive syntax to many things by default, but Linux does. Most app developers have some specific documentation about how this issue might affect program behavior; pay close attention to such platform-specific issues in your program's documentation before settings things up.

Step 3: Nuts & Bolts

For those of you who don't want to spend a lot of money on server hardware, there's good news: The vast majority of the time, you don't have to. A conventional desktop-class PC is often more than enough to get the job done.

That said, although a server doesn't have to run on "server hardware," it certainly doesn't hurt. Most companies explicitly market machines as servers with additional

Remote Hosting

What if you want to run your own server, but you don't trust your ISP to give you the needed bandwidth and want expert help keeping it up and running 24/7? Enter remote hosting, or colocation. Rather than run your server in-house, pack it up and ship it to a hosting center, where along with hundreds of other similar computers, it receives a dedicated IP address and allocation of bandwidth. Your box resides in a temperature- and environment-controlled cabinet. Colocation isn't cheap (about $99 per month and up, for starters), but if you're serious about creating and using a whole server for what you want, it's the best way to go.

One of the biggest reasons to do this is bandwidth. The bandwidth available from most personal or even small-business Internet connections is a lot smaller than what you can get from a professional hosting company, and you can usually monitor the bandwidth usage with the aid of professional tools it provides. Also, the staffers at hosting centers usually have training to deal with emergencies and crises of various kinds. If you have a fairly ambitious project in mind, paying a third party for bandwidth, electricity, physical isolation and protection, and all the other services that accompany remote hosting probably makes more sense than trying to do it *all* yourself. Game servers and community sites usually eat the most bandwidth.

Colocation centers usually come with a bevy of different plans, so be sure to investigate them and buy only what you need. Many of them have a slew of individual options: additional IP addresses, firewall support, onsite automated data backup, and so on. In many cases, you can buy a dedicated server with a preinstalled OS or software options directly from the hosting company.

Note that whatever you plan on doing with a remotely hosted server, start by setting it up locally (if possible) and becoming familiar with it, including applications and test data. This includes the OS itself if you can manage it, so if you've never worked with a server OS, learn about things such as privileges, service accounts, daemons, and networking before you pack the box up and ship it out. These are all things you should experience firsthand on your own terms before you face them in the real world. ▲

There's an enormous number of different colocation providers out there; here are four of the most prominent ones, each listed with one of its more basic hardware configurations and bandwidth plans.

Provider	OS support	Setup Fee	CPU	RAM	Storage	Traffic	Monthly Price
Galaxy Visions (www.galaxyvisions.com)	Unix, Linux, Windows 2000, Windows 2003	none	2.6GHz Intel Pentium IV	512MB (upgradeable to 2GB)	80GB	1Mbps bandwidth	$119.99
ServerBeach (www.serverbeach.com)	Windows XP	none	AMD Athlon XP 2200	1GB PC2700 DDR Memory (upgradeable to 2GB)	80GB IDE hard drive (upgradeable to 2x 250GB)	2,000GB	$109
The Planet (www.theplanet.com)	CentOS*, Upgradeable to Red Hat	none	2.4GHz Intel Celeron	512MB (upgradeable to 2GB)	80GB (upgradeable to 200GB)	750GB	$69
WebIntellects (www.webintellects.com)	Linux Red Hat Fedora	none	2.0GHz Intel Celeron	512MB	80GB	320GB	$175

features that come in handy—more than one network adapter (crucial if you're using the server as a firewall or network sharing device), hard drive arrays for storage redundancy, and multiple processors for crunching incoming requests more quickly.

One of our favorite server-specific bonuses comes through Dell: It packages its servers with a special OS-loading preinstallation environment. Boot it, and the software prompts you to choose from a number of supported OSes (such as Red Hat Linux or Windows Server 2003). Then, it will automate the install process for that OS to a high degree, including the installation of storage device drivers and other manufacturer-specific add-ons. But all of this might be overkill. If you don't need the convenience of these additional things, there's no sense in shelling out extra for them.

Server data needs to be backed up somewhere, and backing it up to an external USB 2.0 hard drive, such as this Seagate model, is an easy way to do it.

The most crucial elements in a server tend to be the hard drive and the network connection(s). A machine marketed as a server will usually feature top-of-the-line hardware for both. If you're building a server from off-the-shelf components and you have a choice of hard drive, whenever possible, go for something that has a three- to five-year warranty rather than the one-year warranty offered for most desktop/consumer-class drives. Also, give favor to the drive with the larger onboard cache. Likewise, a network interface that's explicitly designed for server loads—which typically support Gigabit Ethernet where it's available—will perform better than one designed only for desktop use.

Memory and processing power are actually not the most important things, unless you're running CPU- and RAM-intensive server applications such as game servers. If you plan to only use your server for file sharing or static Web pages accessed by a few people at a time, a conventional desktop machine—even one that's not state-of-the-art anymore—may do the job just fine, and a "server OS" might not be required. An example is a machine that functioned as a network sharing server for two years on nothing more than a Pentium III, 256MB RAM, and the most up-to-date edition of Windows XP with a firewall program. Because it wasn't devoting resources to anything else—no desktop applications ran on the system—it happily chugged along without any hiccups.

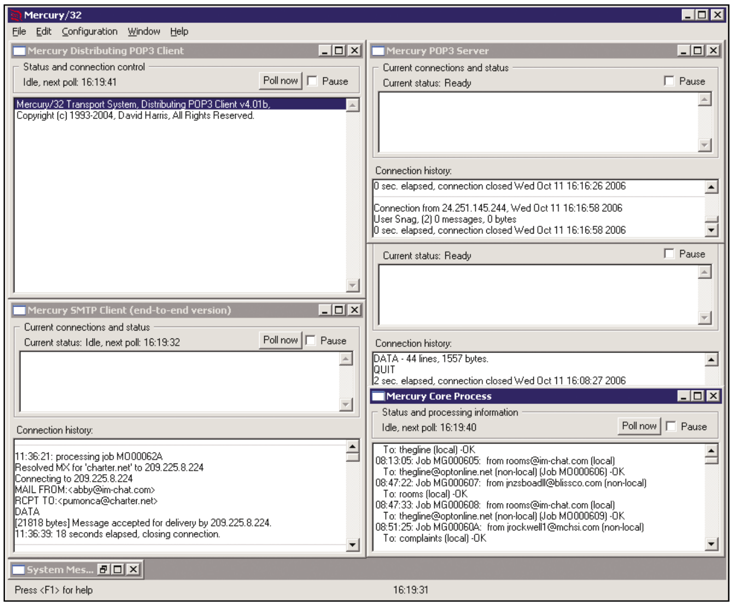
The network hardware that you use in conjunction with the server is also important and can be summed up in four words: the faster, the better. If you can afford Gigabit Ethernet adapters and switches, go for it. At the time of this writing, a Netgear 10/100/1000 8-port switch is available for $68 on NewEgg.com. You can always upgrade

VPN

Through most of this article we've covered servers that are public—available from the Internet at large—and private, available only to your internal home network. But there's another option, an adjunct to both of those, that might also come in handy: a VPN connection to your server.

A VPN is a way of creating a private, encrypted channel of communication between two computers. In this case, it would mean connecting from a machine outside your home (for instance, a notebook computer you're using in a hotel room) to your server. This would give you access to everything on your server (files, shared resources such as printers, and even its network connection through your own ISP) in a protected way. Network connection access is particularly useful if you want to get access to your email on the road and your ISP blocks connections to its incoming and outgoing mail server from outside its own network.

Setting up an incoming VPN server in Windows is fortunately very easy (see www.onecomputerguy.com/networking/xp_vpn_server.htm for a quick guide on how to do this). If your server is behind a network sharing device, you'll most likely need to enable port forwarding on that device to allow an incoming VPN connection (see www.tomsnetworking.com/2003/05/20/how_to_vpn_firewall for details). However, consider that some ISPs do not allow home users to make VPN connections to remote servers, or vice versa, and will actively block the ports used to make VPN connections to a home server. Many ISPs consider any kind of VPN access to a home network a "business-level" service and will forbid access unless you pay for such a plan. ▲


Mercury/32
File Edit Configuration Window Help
Mercury Distributing POP3 Client
Mercury POP3 Server
Mercury SMTP Client (end-to-end version)
Mercury Core Process
System Mes...
Poll now
Pause

Status and connection control

Idle, next poll: 16:19:41

```
Mercury/32 Transport System, Distributing POP3 Client v4.01b,
Copyright (c) 1993-2004, David Harris, All Rights Reserved.
```

Current connections and status

Current status: Ready

Connection history:

```
0 sec. elapsed, connection closed Wed Oct 11 16:16:26 2006

Connection from 24.251.145.244, Wed Oct 11 16:16:58 2006
User Snag, (2) 0 messages, 0 bytes
0 sec. elapsed, connection closed Wed Oct 11 16:16:58 2006
```

Current status: Ready

Connection history:

```
DATA - 44 lines, 1557 bytes.
QUIT
2 sec. elapsed, connection closed Wed Oct 11 16:08:27 2006
```

Current connections and status

Current status: Idle, next poll: 16:19:32

Connection history:

```
11:36:21: processing job MO00062A
Resolved MX for 'charter.net' to 209.225.8.224
Connecting to 209.225.8.224
MAIL FROM:<abby@im-chat.com>
RCPT TO:<pumonca@charter.net>
DATA
[21818 bytes] Message accepted for delivery by 209.225.8.224.
11:36:39: 18 seconds elapsed, closing connection.
```

Status and processing information

Idle, next poll: 16:19:40

```
  To: thegline (local) -OK
08:13:05: Job MG000605:  from rooms@im-chat.com (local)
  To: thegline@optonline.net (non-local) (Job MO000606) -OK
08:47:22: Job MG000607:  from jnzsboadll@blissco.com (non-local)
  To: rooms (local) -OK
08:47:33: Job MG000608:  from rooms@im-chat.com (local)
  To: thegline@optonline.net (non-local) (Job MO000609) -OK
08:51:25: Job MG00060A:  from jrockwell1@mchsi.com (non-local)
  To: complaints (local) -OK
```

Press <F1> for help 16:19:31

Mercury/32 is one of a number of free server applications for Windows; it handles POP3/SMTP email and doesn't require a server edition of Windows to run.

your network piecemeal, buying routers and adapters separate from each other, and retain backward-compatibility with older Fast Ethernet hardware. Most of the speed gain you'll see from using GigE will come when dealing with data hosted directly on your local server or on your peers in the home network; it's not likely to make a significant difference in the speed of data downloaded from the Internet unless your internal router or switch was itself a bottleneck.

If you plan on adding support to the server for wireless network devices (e.g., using the server to create an ad-hoc wireless network), bear in mind the type of signal encryption you might be using on the clients. To make things easier to manage, configure your systems with unencrypted wireless first, before you actually put the server to use, and then add encryption later. Some older wireless devices will not support anything stronger than 40-bit encryption, which are crackable with readily available tools. If possible, try to get hardware that supports WPA/WPA2. You're not only protecting your data but also making it more difficult for an intruder to pretend to be one of your own computers, thus hijacking your network connection.

One thing that is not required of servers is a high-end graphics card (or any graphics card, for that matter). If you have a system with an embedded graphics adapter, that's fine; some people even choose to run servers in a "headless" or "lights-out" configuration, i.e., there is *no* graphics adapter in the system at all. All administration occurs through the network. Most recent computers can run without a video card and may even have a BIOS configuration to specifically disable the video card.

Step 4: Setup & Security

Once you have your hardware, OS, and any additional software, set aside at least a whole day to get things set up and about a week to make sure everything's running smoothly before allowing anyone else access to the server. You may be able to set everything up in the course of a day but allot yourself the time to make sure you can safely correct any unpleasant surprises.

The cardinal rule of keeping security in mind for any computer exposed to the outside world goes triple for a server, even a server that's been set up for only local access (e.g., a local file server). Local servers should require the same eye toward security as a public server. The latest editions of Windows Server 2003 ship in a locked-down state to make them much more secure out of the box, and the integrity of many Linux distributions are widely vaunted, but always take the time to learn for yourself.

A remotely hosted server usually resides in a locked cabinet with only authorized people allowed to have access to the console. That means the only other way in or out of the box is via the network. And *that* means you need to know about network security (and security in general) before assembling a server.

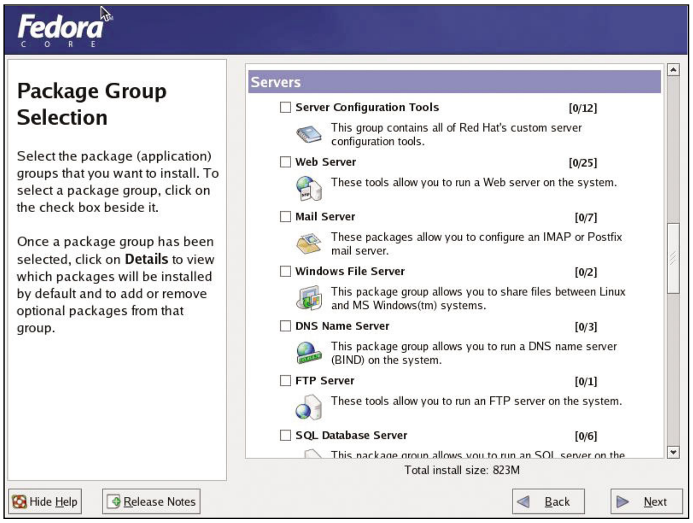
Game Servers

Multiplayer game servers are the heart of many a LAN party. If you want to add a game server to your home network, the standards for such a machine are a little different than what you'd need for a generic file/network-connection sharing system. "Game On" on page 65 will feed your hunger for LAN party servers, but you can whet your palate with these general tips.

Bulk up on memory and CPU where possible. Game servers tend to be pretty demanding in both departments. Naturally, the more players you have, the more CPU resources you'll need to spare, but a good starting point is at least 1GB RAM and a respectable, dual-core, 2GHz CPU.

Latency kills. The response time of a network, also known as latency, is a major factor in gaming. Go for wired Fast Ethernet or better connections whenever possible; if your server's switch isn't readily available from where the rare folks who use laptops for gaming might park themselves, run some network cable from the switch. Wireless connections are notorious for being laggy when used with games.

Don't bother with video. As with a server in general, one thing you do not need to spend money on is a high-end graphics card. You're building a game server, not a game playing machine *per se*, so support for the graphics are entirely up to the players. ▲



Package Group Selection

Select the package (application) groups that you want to install. To select a package group, click on the check box beside it.

Once a package group has been selected, click on **Details** to view which packages will be installed by default and to add or remove optional packages from that group.

Servers

☐ **Server Configuration Tools** [0/12]
This group contains all of Red Hat's custom server configuration tools.

☐ **Web Server** [0/25]
These tools allow you to run a Web server on the system.

☐ **Mail Server** [0/7]
These packages allow you to configure an IMAP or Postfix mail server.

☐ **Windows File Server** [0/2]
This package group allows you to share files between Linux and MS Windows(tm) systems.

☐ **DNS Name Server** [0/3]
This package group allows you to run a DNS name server (BIND) on the system.

☐ **FTP Server** [0/1]
These tools allow you to run an FTP server on the system.

☐ **SQL Database Server** [0/6]
This package group allows you to run an SQL server on the

Total install size: 823M

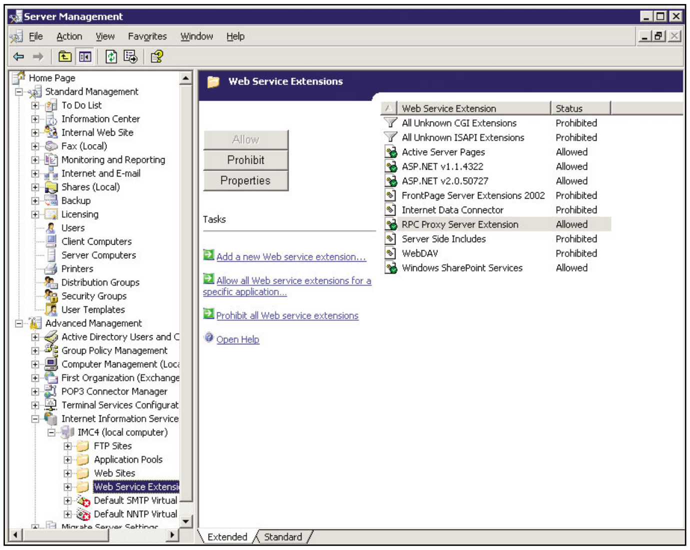
Various breeds of Linux—such as Red Hat's Fedora, shown here—are configurable for different server functions, or run as a server out of the box with little configuration required.

This includes having good password security, having minimal account access on the machine, and setting up some kind of network control (whether it's a firewall on the server itself or using your hosting company's firewall).

One way to enhance security on a local server is to run it in the aforementioned headless or lights-out configuration. Then access the server with Remote Desktop (in WinXP Pro or Windows Server), through an X server connection (with Linux), or through a third-party, remote-desktop client such as VNC (www.realvnc.com). This way, anyone who has an authorized login using any computer on the network (or through a VPN connection) can administer the server.

Step 5: Maintenance & Backup

Another computing rule of thumb—regularly backing up your data—is just as applicable for servers. These days, the easiest and most common way to do this kind of backup is with an external USB 2.0 or FireWire-connected hard drive. Many such drives come with backup software of their own, but you can always use the native backup functions in Windows or Linux if you're comfortable with them. Backing up to CD or DVD is possible, but the backup process requires a lot more babysitting. And if you have dozens of gigabytes of data to back up, it's not as practical as using an external hard drive.



Web Service Extension	Status
All Unknown CGI Extensions	Prohibited
All Unknown ISAPI Extensions	Prohibited
Active Server Pages	Allowed
ASP.NET v1.1.4322	Allowed
ASP.NET v2.0.50727	Allowed
FrontPage Server Extensions 2002	Prohibited
Internet Data Connector	Prohibited
RPC Proxy Server Extension	Allowed
Server Side Includes	Prohibited
WebDAV	Prohibited
Windows SharePoint Services	Allowed

Windows Server 2003 sports an all-in-one administration interface that makes it a snap to centrally manage the whole system.

If you're trying to back up data on a remotely hosted server, you can do this one of two basic ways: You can create the backup files locally and copy them off via FTP, or, if you pay for a hosting service, you can have backups performed at the hosting center as part of your maintenance plan. The former is slow, requires a bit of supervision, and may eat into your monthly allotted bandwidth, depending on what you're backing up. The latter may cost you more in hosting fees but will probably be more thoroughly protected against disaster. One such hosting company, The Planet (www.theplanet.com), has a sliding scale of fees for onsite backups, depending on how much data you want to protect.

Redundant disks, such as RAID mirrors, are not a substitute for disk backups. They are merely an insurance policy against the failure of a given piece of hardware. If you mistakenly trash a piece of data on such a system and your mistake is mirrored to both disks, the only way you'll be able to recover it is with an offline backup. Also, don't forget to defrag; a Windows server with heavy file traffic can usually benefit from being defragmented on a weekly basis, during off-peak hours.

For many people, the best part about learning how to build and use a server (whether at home or remotely) is it gives them a new level of confidence about how they can make use of a PC. When the personal computer was new, most people used it either as a game console or, as one fellow wrote in a book on programming, a glorified typewriter. But the PC's a lot more than either of those things, and it's not as hard as it might seem to find out firsthand. ▲

by Serdar Yegulalp

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ONE FOR ALL

Build A LAN/Media Server

As the popularity of digital photos, music, and movies has exploded, so too has the need to store and share large digital media collections. Travel back in time to just a few years ago, before the Internet was the juggernaut that it is now, and only the most hardcore power users were creating and sharing digital content. But today it's not uncommon for even a casual PC user to have amassed a multigigabyte collection of digital media files.

Storing and sharing said collections on a typical desktop PC can be unruly and downright inconvenient, especially if multiple users want access to the files at the same time. A great way to alleviate the congestion on your desktop PC and make sharing the collection easy is to build a dedicated media server. You can customize your media server for different usage scenarios or budgets, and with the right combination of hardware and software, a server can make your collection safer and much more accessible, even when you're on the road and away from your LAN.

Processors

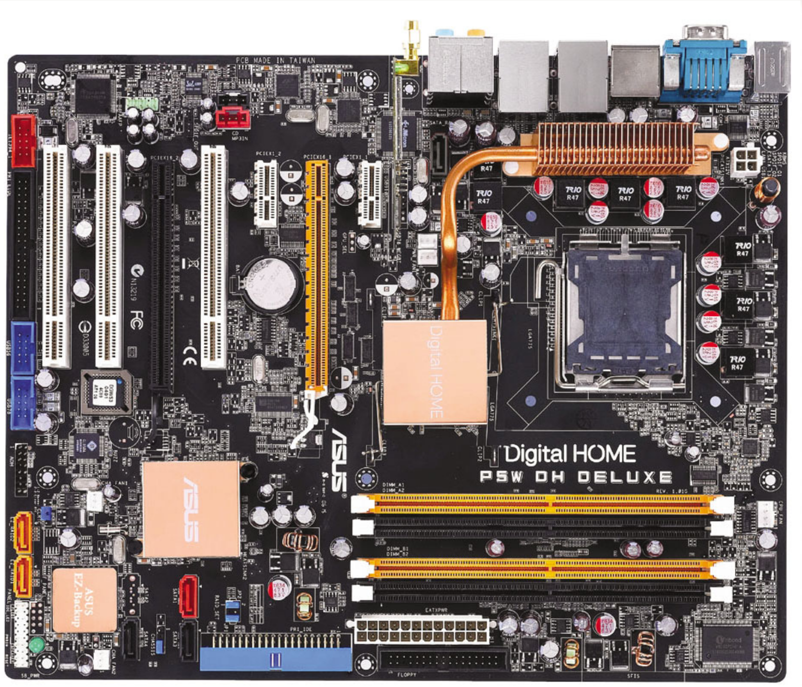
Choosing the right processor for a digital media server will depend on how you will ultimately use the system. If you're going to stuff the server in a remote corner of your home and do nothing but serve files, any up-to-date CPU will do. If you want the media server to act as a home theater PC, too, we would suggest a dual-core processor. Dual-core processors have become more affordable, so there's no point in recommending a single-core CPU any longer.

Both Intel and AMD have dual-core processors available for about $150, namely the Core 2 Duo E6300 and Athlon 64 X2 3800+, that run cool and have plenty of horsepower for ripping and encoding duties. Either of these processors would be a good fit for a typical media server in our opinion, but you can substitute them for something more powerful if you're going to constantly subject your system to heavy workloads.

Memory

We wouldn't recommend building any system these days without at least 1GB of RAM, and the same holds true for a media server. Even if you aren't going to hammer the machine with a large number of connections, we still think 1GB or more of RAM would be best to give the OS and any multimedia applications you'll install plenty of breathing room. Media servers are still a relatively new concept overall, and with the pace at which customized software for them is advancing, it's best to somewhat future-proof the machine with an ample supply of memory. Once again, if you're not going to tax your server with a heavy duty workload, you can probably get by with less memory; however, more RAM is never a bad idea. For a media server that will serve double-duty as a HTPC or entertainment center PC, we think 2GB would be ideal. (*NOTE: For suggestions regarding which memory kits perform best on AMD's and Intel's platforms, make sure to check out the memory roundups in the Aug. [page 62] and Sept. [page 48] issues of* CPU.)

A dual-core processor is an ideal choice for a media server, whether you're using a media server to share files and/or handle ripping and encoding duties.



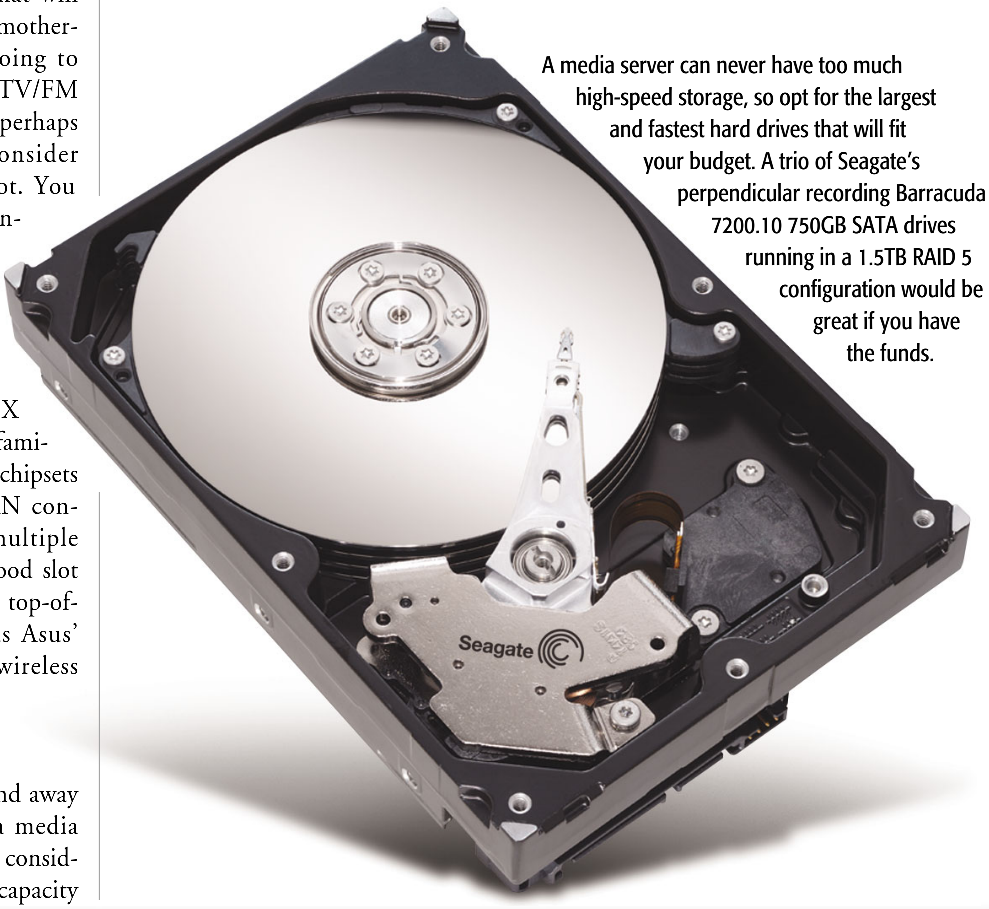
It's best to build a media server on a platform that's known for stability and performance. That usually means going with a high-end chipset such as the Intel 975X Express at the heart of this Asus P5W DH Deluxe, for example.

Motherboard

Selecting a good motherboard for a media server build depends on not only the type of processor you'll use, but also on which expansion cards you'll install in the system. For a machine that will only serve files, just about any motherboard will do. But if you're going to cram the system with multiple TV/FM tuner cards, a sound card, and perhaps a wireless NIC, you should consider the motherboard's expansion slot. You will need to decide which expansion cards you'll need for the system and choose a motherboard accordingly. We suggest a highly integrated motherboard that's based on an up-to-date chipset such as Intel's 975X or P965 or Nvidia's nForce 500 family. Motherboards based on these chipsets typically offer dual-Gigabit LAN connections, HD audio, RAID, multiple FireWire and USB ports, and good slot configurations. And, even better, top-of-the-line motherboards, such as Asus' P5W DH Deluxe, even offer wireless network connectivity, as well.

Storage

The storage subsystem is far and away the most important aspect of a media server. There are many things to consider from speed to redundancy to capacity and accessibility. First, it must be easy for you to get files into and out of the system, so to accommodate all types of media, you should get a good multiformat optical drive and a card reader. It's also a good idea to have an external backup source: a high-capacity USB 2.0, eSATA, or FireWire external hard drive will work well. As for the server itself, you'll likely find multiple opinions on the "correct" way to configure the drives, but as far as we're concerned, multiple



A media server can never have too much high-speed storage, so opt for the largest and fastest hard drives that will fit your budget. A trio of Seagate's perpendicular recording Barracuda 7200.10 750GB SATA drives running in a 1.5TB RAID 5 configuration would be great if you have the funds.

hard drives that you can partition to keep all of your files organized is the safest way to go.

Ideally, a media server should have one drive (or RAID array) dedicated to the OS and apps that you've partitioned to separate the OS from any multimedia applications. Also, you should dedicate another array to your various media files, which you'll want to partition to keep music, movies, and photos separate and organized. If your budget won't let you purchase a multidrive RAID 5 array, an alternative is a small- to medium-sized drive strictly for the OS and apps and a pair of high-capacity drives linked in a mirrored RAID 1 array for the rest of the media. If you've got the funds, however, a RAID 5 array for the media files, consisting of three high-capacity drives, is a great alternative that will offer both redundancy and high performance. To ensure good performance and minimize wear and tear, we suggest modern SATA drives with large 16MB caches and at least 7,200rpm spindle speeds. You can never have too much capacity but keep in mind that 32-bit OSes such as Windows XP can't address volumes larger than 2TB.

Getting data to and from a media server requires fast wired and wireless network connectivity. The gigabit switch built into this Netgear draft-802.11n b/g broadband router would work well, and the unit also offers a fast wireless connection.

Network Connectivity

Getting your media server connected to an internal network or the Web will require a couple of components. Of course, the server must have either a wired or wireless NIC. You're also going to need some sort of hub or switch to connect the machines to each other on the network, and if you plan to access your media remotely, you'll need a broadband connection to the Web, as well. For the sake of security and performance, a wired connection is best in our opinion. And considering how inexpensive gigabit switches have become, there's no point settling for anything less. If you've linked your media server to the network via a wireless connection, you're likely to experience lag and dropped frames if multiple users are streaming audio and video from the machine, and file transfers will be slower, as well. Wired is the way to go.

Because we're talking about a media server that will probably only be servicing a handful of users in a home or small office environment, a good broadband router with an integrated gigabit switch should work well. Netgear's Rangemax Next Wireless-N Router Gigabit Edition (WNR854T), for example, has a built-in four-port gigabit switch and offers a gigabit connection to the broadband modem. The unit is compatible with 802.11b/g and draft-n wireless network adapters and its embedded control panel gives users the ability to open select ports and administer the unit remotely.

Audio & Video

The choice of audio and video components depends on how you plan on using the media server. If the machine is going to be doing nothing but serving files, integrated audio and video are fine. Take the money you'd normally spend on video and sound cards and put it toward the storage subsystem in that case. If you're also going to equip the media server with multiple

If your media server is serving double duty as both a server and a home theater/gaming PC, an HDCP-ready video card with DVI and HD/TV outputs is the best idea.

tuners, double it as a home theater PC, and connect it to an entertainment center, however, go with discreet video and sound cards. We like Creative's X-Fi XtremeMusic sound card; it's one of the only dedicated sound cards that's a clear upgrade to integrated HD audio.

As for the video card, something with a dedicated video engine and HDCP support would be best. If gaming isn't a major concern, a midrange Nvidia GeForce 7600 or ATI Radeon X1600 card would offer a good balance of performance, low power, and great features. These cards are much better suited to playing back HD content at high-resolutions because they free much of the load from the host CPU, offer the added benefit of higher gaming performance, and have dedicated frame buffers (they won't sap system memory).

Power Supplies & Enclosures

Your choice of power supply and enclosure for your media server are important, as well. Due to the fact that you'll likely have your media server powered up and connected 24/7, a quality PSU and an enclosure with good ventilation are of the utmost importance. The best idea is to select a power supply in the 400 to 500W range from a well-respected manufacturer to accommodate the multiple hard drives that will be constantly whirring along in the system.

There's plenty of flexibility in the choice of enclosure, but we can make some broad suggestions. The case should have multiple intake and exhaust fans so

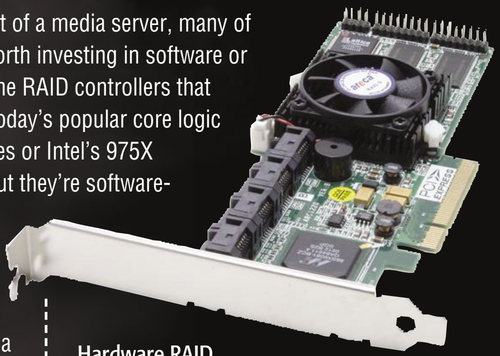
Software Considerations

When you hear the term "server," operating systems such as Windows Server 2003 or Red Hat Enterprise Linux may come to mind. Although these OSes are clearly superior for mission-critical, enterprise-class systems, for the typical personal media server that's servicing only a handful of users in one location, these more complex OSes are by no means a necessity. In fact, for a personal media server, some flavor of WinXP or your favorite free desktop Linux distribution will likely be more than adequate.

Both WinXP and most popular Linux distributions can share files with just about every common desktop OS, including Mac OS. There are also a number of multimedia-centric applications available for each that make it relatively easy to archive and share your collection of digital media. Windows Media Center Edition 2005 already has tools built in for sharing movies, music, and pictures across a network, and it's particularly well-suited to share content with the Xbox 360 by using Windows Media Center Extender. MCE isn't the only choice, however; there are a number of standalone applications available for Windows, such as SnapStream's Beyond TV (www.snapstream.com) that offers most, if not all, of the functionality of MCE and then some. You can even configure Beyond TV to stream content over the Web. SageTV (www.sagetv.com) is another option that works well, especially if you couple it with the SageTV Placeshifter add-on that lets you stream content over a local network or the Web. That copy of WinXP Pro you already have should serve you well.

Linux users have several media server options, as well. Freevo is one open-source tool that not only gives you the ability to record, encode, rip, and play back virtually all popular types of digital media, but it also has a Web interface that lets you access your library and schedule recordings remotely. SageTV, mentioned above, is available for Linux, too, as is its Placeshifter add-on. As for a preferred Linux distro, we've found that Kubuntu and Fedora Core 5 are some of the most user-friendly and feature-rich, but any up-to-date distro will do. ▲

Hardware RAID: Necessity Or Novelty?



Hardware RAID controllers, such as Areca's ARC-1210 PCI Express x8 RAID controller, significantly outperform the software RAID controllers built into many of today's core logic chipsets, especially in write and burst speeds.

With storage such an important aspect of a media server, many of you may be wondering whether it's worth investing in software or hardware RAID for such a machine. The RAID controllers that companies incorporate into many of today's popular core logic chipsets, such as Nvidia's nForce series or Intel's 975X Express, usually perform fairly well, but they're software-based and sap resources from the host PC. Hardware RAID alleviates this problem, and its dedicated processors and cache RAM are much better suited to the demands of a high-speed, multidrive RAID array.

Hardware RAID can be an expensive prospect, however. A suitable hardware RAID card can cost a few hundred dollars or more depending on its controller and cache configuration and its interface. And, the benefits from installing such a card won't be immediately apparent if your drive configuration doesn't exploit its capabilities. In a typical home office/small office environment, for example, a relatively simple two-drive RAID 0 or RAID 1 array won't use the benefits of hardware RAID when only a couple of users are accessing data. In the enterprise with a more complex RAID array and dozens or even hundreds of users accessing data, though, software RAID can't hold a candle to hardware RAID.

To give you an idea as to how a true hardware RAID performs vs. software RAID, we ran a handful of tests using a PCI Express x8 Areca ARC-1210 RAID controller and compared the results to those we obtained with an Intel ICH7R controller. We tested each controller under WinXP Pro with a trio of Western Digital Raptor WD1500 drives connected to each. Regardless of the type of RAID array we employed, the Areca hardware controller simply dominated the ICH7R. In regard to RAID 0 performance, the hardware and software controllers were comparable in Random Access and Read performance and in the various PCMark05 tests, but the hardware controller more than doubled the performance of the ICH7R in the Burst Read and Write Average tests. In a RAID 5 configuration, the deltas get even larger, especially in regard to average write performance in which the Areca card offered a 25-fold increase in performance. ▲

A constant, clean supply of power is paramount to a stable system, so consider a PSU from a manufacturer such as PC Power & Cooling, Enermax, OCZ, or Thermaltake. And, to keep the noise level down, make sure the PSU has quiet fans, too.

If you're going to run your media server 24/7, assemble the system in an enclosure that has multiple intake and exhaust fans to keep its internal components cool.

that if one dies, the others can still draw air through the system. And ideally you'll want to outfit the intake fans with filters or dust guards, which will help keep the system's internals clean. As is the case with most of the other components in the media server, though, the way you plan to use the system will ultimately determine which enclosure best meets your needs. ▲

by Marco Chiappetta

	Intel ICH7R Single Drive	Intel ICH7R Software RAID 0	Intel ICH7R Software RAID 5	Areca ARC-1210 Hardware RAID 0	Areca ARC-1210 Hardware RAID 5
HD Tach v3.0.1.0					
Burst Read (MBps)	134.4	247.4	233.7	626.4	646.7
Write Average (MBps)	81	139.2	11.2	281.5	282.5
Read Average (MBps)	78	135.6	134.8	154.8	141
Random Access (ms)	8	8.5	8.5	8.3	8.6
Futuremark PCMark05					
Application Loading (MBps)	9.67	11.58	7.64	11.82	10.97
General Usage (MBps)	8.48	12.3	6.22	16.16	14.52
Windows XP Startup (MBps)	11.43	18.62	11.1	16.12	18.22

GAME ON

Build A Dedicated Game Server

Ever been to a big LAN party and experienced in-game lag so bad it made you want to go home and play online? Crippling lag makes no sense when all of the equipment is wired together in the same room; the most likely cause is that someone is playing on the same machine that's hosting the game. This is called listen mode, and it's bad for everyone because the kind of games that people play in a LAN environment will bring a computer to its knees. As the PC struggles to maintain a playable frame rate, it prioritizes requests from the host machine and tends to delay its responses to requests from other players. This gives the host an unfair advantage and you an easy target for your empty Rockstar cans.

Listen mode can work if the host has a beefy PC and there are only a few participants, but at bigger LAN parties or with more resource-intensive games, the only fair solution is putting together a dedicated game server. These are designed to sit in a corner, focusing all of their power on handling each player's connection, virtually eliminating lag.

It's best to know what components you need before grabbing the first server motherboard or AMD Opteron processor you see. Dedicated game servers have much different hardware requirements than file servers to operate efficiently, and if you want to build one for LAN gaming, portability is another concern.

Case

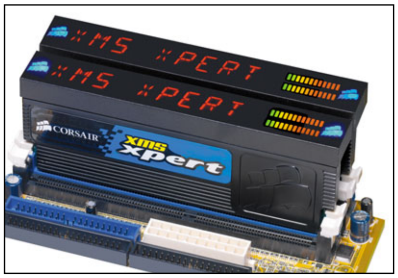
The word "server" conjures up images of an enormous tower case packed with hard drives, system monitor panels, and other fancy gear; but unless your LAN parties are always at the same place, that sort of setup is practically worthless. You want a server that you can grab and take anywhere the action is taking place. Plus, you want hardware that makes it as easy as possible to quickly break the thing down and just as quickly set it back up again. Fortunately, dedicated game servers don't require a lot of hardware, so keeping it light and small is fairly trivial.

When it comes to portable cases that can accommodate server-friendly hardware, there are plenty of options, but it's hard to go wrong with something from Shuttle, because they've been in the SFF business so long. The SN27P2, for example, comes with a full-featured motherboard, supports AMD Athlon 64 X2 and FX dual-core CPUs, has integrated Gigabit Ethernet, and is much easier to lug around than a bulky tower case.

Whatever case you decide on, make sure it has a high-quality power supply with enough wattage to keep the CPU and memory churning away at full capacity for several hours at a stretch. This shouldn't be a problem, because the system doesn't need a power-hungry 3D card or multiple hard drives.

Cooling is also a big issue for game servers because they work so hard for so many hours. Again, the Shuttle case just mentioned comes in really handy here, because Shuttle designed it with liquid-filled copper tubing to whisk heat away from the CPU and out of the case for efficient cooling from the get-go. When considering case cooling, focus on pampering the CPU and RAM, as they do most of the work.

One of the best things about LAN parties is all the trash-talking from people fragging each other in the same room. And because this can create high ambient noise levels at LAN parties, there's no need to drop a bundle for an expensive silent cooling setup for a LAN server. Just make sure to equip the case with good, clean fans and, using rounded cables, neatly tie and route your cabling away from the airflow path whenever possible.



You want a lot of fast memory for a game server. Corsair's fancy XMS6400 Xpert sticks, which have an integrated, programmable LED display, are an excellent choice.

Since you don't need a high-capacity drive for a game server you might as well go with something fast, like this 10,000rpm Western Digital Raptor X.

CPU

If there's one thing you don't want to skimp on when gathering server hardware, it's the CPU. The speed of the server's CPU often determines the maximum number of players that can connect to the server, so the faster the better. A 16-player Battlefield 2 game, for example, requires a dedicated server with at least a 1GHz CPU. With the maximum complement of 64 players connected, however, the minimum CPU requirement jumps to roughly 3GHz for single-core Intel processors (slightly lower for multicore CPUs) or 2.2GHz for an Athlon 64 CPU.

Don't run anything but the OS and the dedicated server software whenever possible. Although raw CPU horsepower is great for dedicated game servers, investing in a dual-core or multicore CPU is also worthwhile. Windows XP does a decent job of splitting incoming requests between the cores to give you more bang for your megahertz relative to using a single core, and things will only get better as designers produce the games of tomorrow with true multithreading in mind.

Memory

The best dedicated game servers have loads of the fastest memory the motherboard supports. When a dozen or more people are all gathered in the same room shooting at each other, the server has a lot to keep track of. The goal is to keep as much of this data in memory as possible so that the server rarely, if ever, needs to access the hard drive as a swap memory area.

Much like the CPU, the amount of memory in the system has a tremendous impact on the number of simultaneous connections a server can adequately handle. Once again, Battlefield 2 provides the best example, as the dedicated server software can support up to 16 players when installed on a system with at least 256MB RAM; you'll need at least 2GB to host a 64-player session.

Always use more than the recommended minimum whenever possible for the smoothest possible performance, especially if you play with mods enabled, as user-created content is rarely as optimized as the game itself. Also take advantage of technology like dual-channel memory if your motherboard supports it. Buying two matched 1GB sticks of RAM for a dual-channel setup, for example, provides vastly superior memory performance compared to using a single 2GB stick. Look for a motherboard that supports a respectable amount of RAM so there's plenty of opportunity for the system to grow with your needs as games become more demanding.

Drives

Although fast and redundant hard drives are terrific for file servers, they aren't as big a deal with dedicated game servers used for LAN parties. Because the CPU and system memory shoulder much of the workload, the hard drive only really comes into play during the following instances: when the game initially launches, when the system must load new levels between matches, and when it creates log files. Most dedicated server programs don't consume a lot of hard drive space, so even an older 40GB model offers plenty of capacity to store the files you need for dozens of games. If you plan to distribute large mods, patches, or other files, it's best to create a separate file server or use a portable hard drive for this task and reserve the game server solely for hosting games.

It might be tempting to pop an optical drive into the case because they are so inexpensive these days, but you probably don't need one. You can often download the software you need from the Internet and grab whatever else you need using the LAN.

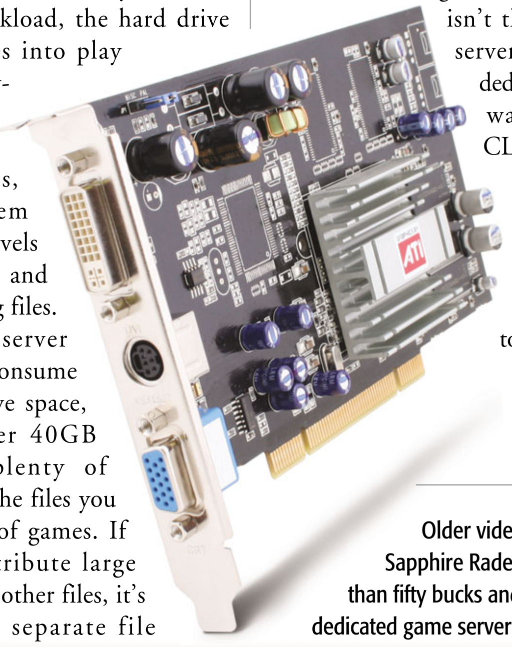
Networking

Good network hardware is crucial to smooth LAN performance, and, whenever possible, wired connections are always preferable to wireless. Ethernet cables are reliable, easy to install, and eliminate the possibility of interference that is often a problem when dozens of wireless Ethernet devices crowd a small space. Even a 64-player game of Battlefield 2 requires less than 10Mbps of bandwidth, so using cheap Fast Ethernet gear is more than sufficient.

Gigabit Ethernet is always nice for speedy file transfers, which are important at LAN parties when multiple computers need to share mods, maps, and other files. If you go that route, be sure to download (and, if necessary, distribute) the latest driver from the manufacturer before installing the NIC because GigE is largely dependent on good drivers for achieving its potential.

Video & Audio

Behind every good gaming rig is a great video card, but that isn't the case for game servers. Because most dedicated server software uses a basic CLI (command line interface) or 2D windows, a 3D graphics accelerator isn't necessary. You'll want to avoid using integrated video that steals its memory from the system



Older video cards like the Sapphire Radeon 9250 cost less than fifty bucks and work just fine in a dedicated game server.

RAM, but other than that any old discrete video card should do. The server doesn't even need a dedicated monitor: You can connect it to the secondary input port of any other monitor at the party for initial configuration and remotely perform any other administrator commands from within the game.

As for audio, you don't need it. Consider disabling integrated audio in the system BIOS to free up more resources for players and don't bother installing a sound card if you have one sitting around.

Operating System

A lot of dedicated game server software is available in both Windows and Linux flavors, each with its inherent strengths and weaknesses. Windows servers are easier to set up and manage because so few people have extensive experience working with Linux. Windows costs money if you're building a machine from scratch, but if you're recycling parts from older systems there's a good chance you have an existing Windows license that you can transfer to the new server.

Most Linux distributions are available for free, and many have lower overhead requirements than Windows, which frees up more system resources for game-related tasks instead of simply keeping the OS happy. Of course, you must choose a distribution to use and learn the ropes of Linux, but the payoff is definitely worth the effort.

You've Been Served

Once you've pieced together the server and slapped on an OS, all that remains is downloading and installing dedicated server software for your favorite games. If you have a choice between using a CLI version of a dedicated server or using a GUI version, go for CLI. They are much more difficult to lean and configure, but they also consume very few system resources compared to software that uses a graphical interface and often allow for more powerful configuration options.

Be sure to stress-test the server using different games to see how many players it can handle comfortably in several scenarios If you have a beefy enough system, it's possible to host several instances of the same game server on a single machine or to run multiple games simultaneously. And the one thing you won't have to worry about is being branded a cheater. ▲

by Tracy Baker

LAN Party Survival Kit

Gamers cannot survive on pizza and Red Bull alone: You'll need plenty of other provisions to properly prepare for contingencies. Beyond the basic hardware like switches, Ethernet cables, and power strips, here's a brief rundown of what we consider to be must-have equipment:

Zircon CF12 Circuit Finder

- **Duct tape.** There are a zillion uses for this stuff, including covering off-limits electrical outlets and securing cords so people don't trip over them.
- **Circuit breaker finder.** This will help quickly map circuits so you don't overload anything.
- **USB memory key/blank CDs and DVDs/Portable USB 2.0 hard drive.** If you need to get files from one computer to another without using the network, these are indispensable.

Lexar JumpDrive Lightning USB Flash Drive

- **Paper, pens, and markers.** You'll need to take notes and food orders, track stats, and make bathroom and exit signs.
- **Digital camera.** You may need the pictures for evidence.
- **Blankets and pillows.** Grab extras because someone is guaranteed to forget his sleeping gear.

Canon EX-Z1000 Digital Camera

- **802.11a/b/g bridge.** Configure this to work with your LAN hardware ahead of time in case somebody's NIC blows up and she needs to get back into the action.
- **Computer repair kit.** With this many machines in a room, something bad is bound to happen.
- **Paper clips.** Nothing works better for popping open a stuck optical drive.
- **Paper towels.** Those people you invited? They're messy . . .
- **Plunger.** . . . very messy.
- **Gas-powered generator.** Power's out? Game on!

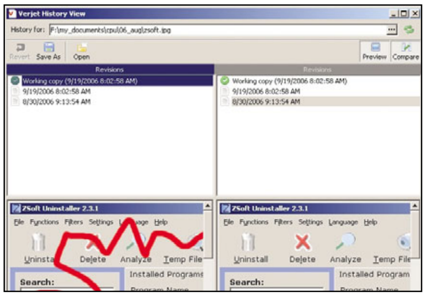
Target First Aid Kit

- **Extra monitor cable.** Don't forget to bring an extra cable for your server in case you need to reconfigure a setting or two.
- **Big trash cans and trash bags.** Whatever venue you're using, there's never enough of these.
- **Extra headphones.** If "that guy" shows up with computer speakers, hand him a pair. (preferably pink ones shaped like Hello Kitty).
- **Emergency medical kit and fire extinguisher.** These'll keep things under control until the cavalry arrives. Look for an extinguisher marked BC or ABC; the C means it can safely put out electrical fires. Halon and Carbon Dioxide extinguishers are best for LAN parties because they don't leave equipment-damaging residue.
- **Toilet paper.** Trust us on this one.

The Bleeding Edge Of Software

Inside The World Of Betas

Verjet 1.0 Beta



History for: F:\my_documents\cpu\06_aug\zsoft.jpg

Working copy (9/19/2006 8:02:58 AM)
9/19/2006 8:02:58 AM
8/30/2006 9:13:54 AM

Official product name: Verjet
Version # previewed: 1.0 Beta
Publisher: Verjet
Developer and URL: Verjet; www.verjet.com
ETA: Q4 2006
Why you should care: Simple, effective version control for your files is very useful.

There are times when the undo button just isn't enough: You don't want to undo the last one, two, or 10 actions you've performed, you want to start over completely with your changes. Many programs have a revert command, but these usually only let you go back one version. Enter Verjet, a universal versioning and regression utility for Windows, which works with nearly anything and is simple to use.

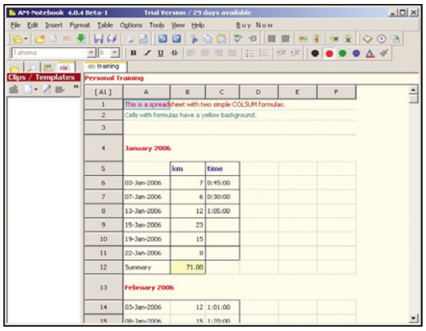
Once you install Verjet, you tell it what folders you want it to monitor (such as My Documents), and you're basically finished with setup and configuration. Thereafter, any time you save a file in that folder or its subdirectories, Verjet takes a copy, renames it based on the date and time, and then stores it away in an invisible subfolder called "__history." To restore an older version of a file, click the Browse button in the Verjet Control Center, right-click your file, and select History from the drop-down menu. In the Verjet History View window, select the older version of the file you want to restore and click the Revert button.

Although compatible with many programs' files, there can be drawbacks. For starters, Verjet consumes a lot of hard drive space; for example, 20 versions of a 100KB Word document take up 2MB in that hidden folder, and there's no built-in way to reclaim space after you intentionally delete the original file. Working with very large files (such as videos) dramatically worsens the hard drive space problem and can slow the computer somewhat.

Still, with huge hard drives and fast processors cheaper than ever, perhaps these problems aren't that significant, especially when dealing mostly with Microsoft Office files. Final version prices are yet to be determined, but the beta is "free for now," meaning now is the time to get in on the action. ▲

by Warren Ernst

AM-Notebook 4.0.4 Beta-2


AM-Notebook 4.0.4 Beta-1
Trial Version / 29 days available
File Edit Insert Format Table Options Tools View Help
Buy Now
Tahoma
training
Clips / Templates

Personal Training

[A1]	A	B	C	D	E	F
1	This is a spreadsheet with two simple COLSUM formulas.					
2	Cells with formulas have a yellow background.					
3						
4	January 2006					
5		km	time			
6	03-Jan-2006	7	0:45:00			
7	07-Jan-2006	6	0:30:00			
8	13-Jan-2006	12	1:05:00			
9	15-Jan-2006	23				
10	19-Jan-2006	15				
11	22-Jan-2006	8				
12	Summary	71.00				
13	February 2006					
14	03-Jan-2006	12	1:01:00			
15	08-Jan-2006	15	1:20:00			

Official product name: AM-Notebook
Version # previewed: 4.04 Beta-1
Publisher: Martin Aignesberger
Developer and URL: Martin Aignesberger; www.aignes.com
ETA: Q4 2006
Why you should care: Perhaps the best online sticky notes that ditch the yellow pads.

Yellow sticky notes have been a fixture on the Windows Desktop for years, but as with real Post-it Notes, there are limits to their uses. Lots of sticky notes tend to get disorganized and usually can't hold that much information, but there are alternatives. One of the more useful is AM-Notebook, a "note-taking program" that combines useful features with simplicity and virtually instant access.

The main way AM-Notebook breaks away from the limitation sticky notes present is to get rid of the yellow notepad theme. As an alternative, AM-Notebook has a dual-pane window with an organization tree on the left and your notes on the right. Tabs in each pane let you further organize multiple notes at once.

Although AM-Notebook can handle more than just text, it does a good job with it: There are several formatting commands for notes (fonts, colors, paragraphs, etc.), you can add hyperlinks to your notes, and so on. You can also set up spreadsheets with AM-Notebook, but they can only handle simple mathematical formulas.

Built into the program is a calendar, an alarm, and even an installer for getting AM-Notebook and your data onto a USB drive for maximum portability. Toss in basic encryption, built-in backup and restore functionality, a fast search and filter command, and multiple levels of undo and redo, and nothing has ever managed your random thoughts better. There's also a place to quickly store and recall all that boilerplate text you're always using.

The beta is well-mannered, comes with an excellent Help file, and already feels like polished, "released" software. If you don't pay for the AM-Notebook Pro version ($40) after the free 30-day trail period, the software will revert to the free version that has fewer features. ▲

by Warren Ernst

UP TO SPEED

Upgrades That'll Keep You Humming Along

Both Google's Earth application and the novel wallpaper EarthDesk get a refresh this month, and AOL's IM client adds multimedia. But the big upgrade this month is an enhanced, but still buggy, iTunes.

Upgrades

AOL AIM 6.0.4.5 Beta

The next release of AOL's instant messenger changes the user interface surrounding integrated video, images, VoIP, and chat. AOL has revised the layout and resolved formatting problems in the IM Compose and My Buddy info windows.

Get it at: www.aim.com

EarthDesk 3.5.4

This stunning wallpaper puts a real-time image of the earth on your Desktop. This iteration improves rendering speed, reduces the size of the watermark in the evaluation version, and fixes minor bugs.

Get it at: www.xericdesign.com

eMule 0.47c

The file sharing client that uses the eDonkey2000 protocol fixes bugs in Kad 2.0, First Runtime Wizard, and adds more sanitizing for Kad packages. This fix also tweaks Shareddir.dat and Addresses.dat files to skip empty lines and spaces.

Get it at: emule.sourceforge.net

Google Earth 4 Beta

Google now has a new, easier interface. Interface elements can now fade from the screen when you're not using them. The 3D modeling feature now includes texture mapping for more realistic views. Earth now comes in multiple languages.

Get it at: www.google.com/earth

Google Talk

Google's IM and VoIP client now has file transfer capabilities. Also, a new feature shows others in your network the music track currently playing on your PC and lets you browse the musical tastes of other Google Talkers worldwide.

Get it at: www.google.com/talk

iTunes 7

Touted as the most significant iTune update in years, the the left-hand nav bar reorganizes your media content into sections. Apple upgrades the iPod interface substantially with multiple tabs handling all the new media types, such as games and movies. If you have the first release of iTunes 7, download the 7.01 bug fix, which eases some performance issues.

Get it at: www.apple.com/itunes

Netscape 8.1.2

Yup, the original Web browser is still kicking, and in this version you get spyware protection and a security center. This update enhances RSS support, tabbed browsing, and overall performance.

Get it at: www.netscape.com

ObjectBar 2.0

With this new release, you can build desktop environments for launching and monitoring programs. ObjectBar is part of Stardock's Object Desktop suite.

Get it at: www.stardock.com

Opera For Windows 9.02 (Build 8584) RC1

The browser now works with Live.com and works better with Gmail's spell checker and the new Yahoo! Mail. Problems with in-browser Flash video (such as YouTube) are fixed, as well.

Get it at: www.opera.com

Thunderbird 1.5.0.7

Mozilla's email client gets some bug fixes and several security patches. The new version also improves stability.

Get it at: www.mozilla.com/thunderbird

Winamp 5.3

The media player now has Unicode file name/title support, optional 24-bit playback with some codecs, and Replaygain support for major formats. This version also improves full-screen video seeking.

Get it at: www.winamp.com

Driver Bay

ATI Catalyst 6.9

ATI says the new drivers for Radeon cards increase performance up to 23% in 3DMark2006 with antialiasing enabled on some recent models. Doom 3 performance improves, as well.

Get it at: www.ati.com

Logitech SetPoint 3.1.1.116

For most Logitech mice and keyboards, the SetPoint software customizes keys, buttons, and repeat rates.

Get it at: www.logitech.com

nLite 1.2 RC

This tool lets you choose elements of Windows to remove. There is a wide range of fixes related to verifying burned files, Desktop themes, Help And Support removal, and so forth.

Get it at: www.nliteos.com

Realtek AC'97 Audio Codecs

New versions of the AC'97 codecs are now available in an A3.93 release for all Windows versions. There's also a beta for Vista.

Get it at: www.reatek.com.tw

Realtek Audio Drivers 649

The latest version of Realtek audio drivers for a range of RTL81*XX* chipsets. The new auto installation program supports most Windows versions, including the latest 64-bit edition.

Get it at: www.realtek.com.tw

by Steve Smith

Way Offsite Backup

A Look At Six Internet Backup Services

There are many reasons why a user may not take the time to back up his personal data files: He may forget to run his backup software or not want to spend a lot of money up front on expensive hardware that might only fail years down the road or get lost. And of course, there's the issue of "backup rot," where backed up files are far too hopelessly out of date to be of any real use once they're restored.

In the face of these problems, the idea of using an Internet-based service to back up your data starts to make sense. Certainly, copying megabytes (or gigabytes) of data to the Internet can take hours, even over broadband, but once the initial copy is made, daily or weekly updates only take a few minutes and usually run in the background or at night. Backup software automatically keeps track of the new files you create, and someone else takes care of maintaining the hardware and making sure all is well with your data.

There are at least a dozen IBSes (Internet backup services) vying for your business these days, offering different capacities and levels of service at various price points. I expected to find essentially the same IBS services everywhere but was surprised when I found a wide range of features and levels of performance among IBSes. I tested six IBSes with a set of 5,610 core files (totaling 143.9MB), some of which are highly compressible office files, while others are noncompressible JPEG, ZIP, and multimedia files, representing what a "typical" user may want to back up today. (WinZip 10 compresses them to 119.8MB.) My test computers ranged from a 2.4 to 3GHz Pentium 4, connected via a 6Mb/768Kb DSL connection.

Iron Mountain Connected DataProtector 7.5.2 Hotfix 5

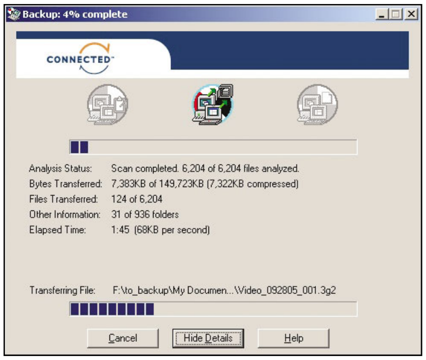
Connected DataProtector appears at first to be the least feature-filled IBS, but there's something to be said for getting the core job at hand done quickly with minimal resources and an interface that looks good and makes sense. CDP managed to back up all my test data in 31:30 (minutes:seconds) without hiccups, while consuming 6% of the CPUs cycles and only 8MB of RAM.

Upon installation, CDP prompts you to locate "typical" files worthy of backup, such as the My Documents folder, Internet Explorer Favorites, and Outlook/Outlook Express emails and address books. Then you select the folders, which are set up in a directory tree, by clicking the checkboxes. Setting file selection rules is fairly straightforward, letting you include only DOC, XLS, and PPT files while excluding EXE and DLL in specific folders, for example.

Backups happen both on a schedule (actually a random time within a designated time span; usually at night), and/or when CDP detects an active Internet connection, an idle CPU, and/or after a set amount of time has passed.

As with all the IBSes in this review, subsequent backups scan your system and online data store and then only transfer new or changed files. Also, similar to the other services, CDP transmits your files via a 128-bit AES-encrypted connection for security. Unlike most other IBSes, however, CDP lets you order a CD/DVD set of your data ($24.95 for a one to three CD/DVD set; shipping rates vary).

Plans start at 500MB of storage (uncompressed) for $9.95 per month all the way up to 30GB for $74.95 per month, and you get 30 days of versioning control. If you have multiple PCs, you have to sign up for a Connected DataProtector small business plan.



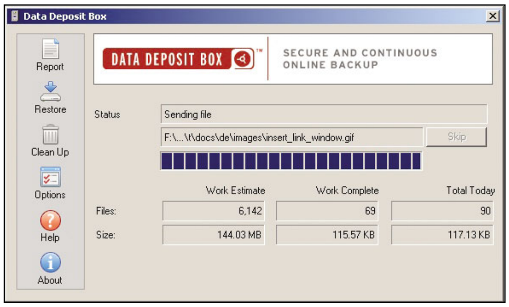
```
Analysis Status:     Scan completed. 6,204 of 6,204 files analyzed.
Bytes Transferred:   7,383KB of 149,723KB (7,322KB compressed)
Files Transferred:   124 of 6,204
Other Information:   31 of 936 folders
Elapsed Time:        1:45  (68KB per second)

Transferring File:   F:\to_backup\My Documen...\Video_092805_001.3g2
```

Connected DataProtector 7.5.2 Hotfix 5
$79.95 per year for 250MB
(other plans and prices vary)
Iron Mountain
onlinebackup.connected.com
●●●●

Acpana Business Systems Data Deposit Box 2.1081

With Data Deposit Box you get the transmission and server encryption and security you'd expect, and the backup routines are simple to use and unobtrusive. Its pricing scheme and bandwidth usage patterns, however are dramatically different.

Most IBSes have plans similar to cell phone service plans: You prepay for a set amount of storage space each month and then use as much of it as you can without moving onto the next level of service. In contrast, DDB charges 1 cent per megabyte per month up to 1GB and then $3 per gig per month after that. That makes 300MB $3 per month, 2.1GB $13.47, and 23GB $77.82. Also, if you just want to back up your current 3MB project with DDB every night before you archive it yourself on your own CDs, that will set

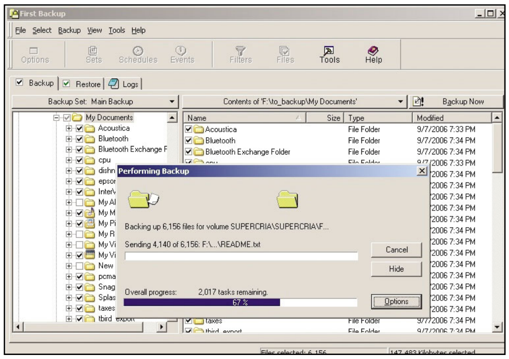


Status: Sending file

F:\...\t\docs\de\images\insert_link_window.gif

	Work Estimate	Work Complete	Total Today
Files:	6,142	69	90
Size:	144.03 MB	115.57 KB	117.13 KB

Data Deposit Box 2.1081
1 cent per megabyte per month
(up to 1GB)
Acpana Business Systems
www.datadepositbox.com
●●●●


First Backup
File Select Backup View Tools Help
Options Sets Schedules Events Filters Files Tools Help
Backup Restore Logs
Backup Now
Performing Backup
Cancel
Hide
Options

Backup Set: Main Backup

Contents of 'F:\to_backup\My Documents'

Name	Size	Type	Modified
☑ Acoustica		File Folder	9/7/2006 7:33 PM
☑ Bluetooth		File Folder	9/7/2006 7:34 PM
☑ Bluetooth Exchange Folder		File Folder	9/7/2006 7:34 PM
☑ taxes		File Folder	9/7/2006 7:34 PM

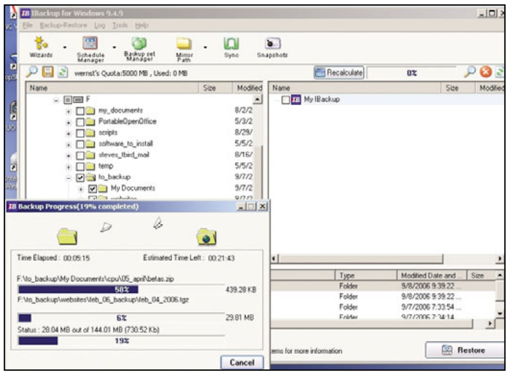
Backing up 6,156 files for volume SUPERCRIA\SUPERCRIA\F...

Sending 4,140 of 6,156: F:\...\README.txt

Overall progress: 2,017 tasks remaining. 67 %

Files selected: 6,156 | 147,483 Kilobytes selected

FirstBackup 6.2.10.0
$38.95 per year for 50MB
(other plans and prices vary)
Amberwave Communications
www.firstbackup.com
●●●◖


IBackup for Windows 9.4.9
File Backup-Restore Log Tools Help
Wizards
Schedule Manager
Backup set Manager
Mirror Path
Sync
Snapshots
Recalculate
Backup Progress(19% completed)
Cancel
Restore

wernst's Quota:5000 MB , Used: 0 MB

Time Elapsed : 00:05:15 Estimated Time Left : 00:21:43

F:\to_backup\My Documents\cpu\05_april\betas.zip 58% 439.28 KB

F:\to_backup\websites\feb_06_backup\feb_04_2006.tgz 6% 29.81 MB

Status : 28.04 MB out of 144.01 MB (730.52 Kb) 19%

IBackup 9.4.0.9
$9.95 per year for 5GB
(other plans and prices vary)
Pro Softnet
www.ibackup.com
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you back 3 cents per month, and there's no minimum charge.

Data Deposit Box doesn't charge you extra for file versioning. (You must manually enable file versioning, which then lets you review previous versions of files you've changed as far back as two years ago.) Also, there aren't any extra charges for multiple computers; you only pay for the storage you use. With DDB you get online sharing, as well, letting you mark backed up files or folders as "sharable," which assigns them a URL and a custom password. You can then email the URL to friends and family that you want to have access to your files or folders, and DDB will keep track of who downloaded what when.

DDB doesn't follow a set schedule and only uploads files during inactivity. Uploads are extremely slow (plan on a few days for the first backup to occur if it's very large) and updates seem just to happen whenever they happen, but you won't notice any general PC slowdown: CPU usage is 2% and RAM 9MB.

Amberwave Communications FirstBackup 6.2.10.0

FirstBackup offers a good combination of features and price and offers support for multiple computers. Its backup software resembles many standalone backup products and is full of features many IBS packages don't offer. Still, I experienced some hiccups, and remote access to backups may be problematic for some. Pricing plans range from 50MB for $11.95 per quarter year to 1GB for $11.95 per month.

Most IBSes offer some sort of browser-based access to backed up files (in fact, some only offer file restoration and remote access via the Web), meaning you can access your backup files from any computer, even if you're on the road or your existing computer is unusable. FirstBackup's Web access uses an ActiveX control, meaning it only works with Internet Explorer, and even then, the unsigned control requires you to adjust IE's security settings in order to run. On the other hand, if you don't like the idea of anyone with Internet access getting at your files, you could actually consider this a feature.

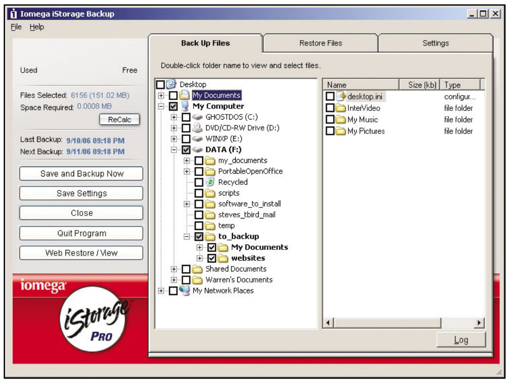
The backup software monitors your system for file changes and performs incremental backups nightly by default. Like conventional backup programs, you can set it to perform backups at any time, even before your computer shuts down. Because FirstBackup uses filters extensively, restoring groups of files across directories is simple, and a similar interface makes getting at older revisions of files a breeze, too.

CPU utilization during backups is low (2%), but memory usage (14MB) is average, and the bandwidth usage is less than 10KBps for most files. My initial backup halted but resumed after a reboot, which thwarted my efforts to time the first overall backup.

Pro Softnet IBackup 9.4.0.9

IBackup is the leader in features of this IBS roundup, and it also takes first place in my speed tests and the IBS software beauty pageant. It's marred only by a complex pricing structure and a large memory footprint.

Consuming 32MB of RAM and 11% of available CPU cycles, IBackup ripped through my first backup of the test file set in 25 minutes. The computer felt somewhat slow while doing certain tasks that needed significant CPU dedication, and additional computers on the network



Double-click folder name to view and select files.

Files Selected: 6156 (151.02 MB)
Space Required: 0.0008 MB
Last Backup: 9/10/06 09:18 PM
Next Backup: 9/11/06 09:18 PM

iStorage 4.00.000
$64.69 per year for 1GB
(other plans and prices vary)
Iomega
www.iomega.com/istorage
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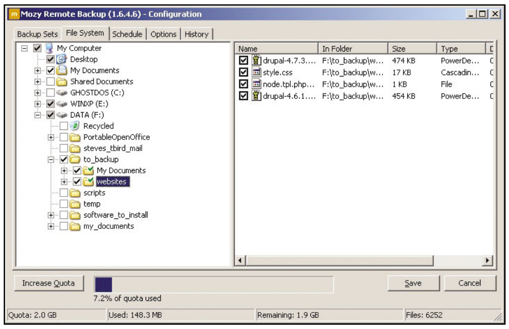

7.2% of quota used

Quota: 2.0 GB | Used: 148.3 MB | Remaining: 1.9 GB | Files: 6252

Mozy 1.6.4.6
Free per year for 2GB
(other plans and prices vary)
Berkeley Data Systems
www.mozy.com
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browsed the Internet slightly sluggishly, but the backup went without a hitch. The backup software interface is pleasing to look at and use, with dialog boxes positioned conveniently and well-written on-screen prompts.

IBackup makes it easy to restore files from the archives, though the base plans don't include file versioning, but there are several other options. You can use an FTP to transfer your files, use IBackup's IDrive software to map your account to a drive on your PC (to drag-and-drop, edit, open, and save files directly from applications), or you can connect to the storage account as a WebFolder. Of course, there's a Web-based GUI, as well (arguably the most attractive and intuitive of this roundup), which makes changing advanced settings a snap. IBackup sets schedules and uploads your recently added or changed files every night.

Plans range from 5GB for $9.95 a month all the way up to 200GB for $400 a month (larger plans can accommodate multiple computers and users). For gargantuan backup needs, IBackup will mail you an external hard drive or NAS server to copy your files onto and mail back and then IBackup syncs your files from there.

Iomega iStorage 4.00.000

When a major vendor of personal backup hardware gets into the IBS business, that's probably a good indication of where Internet backup technology is heading. Iomega's entry into the field is good and getting better, and its well-known name should ease user concerns about data safety.

Iomega offers two levels of service: one for home users (starting at 1GB for $5.99 per month) and one for businesses (ranging from 1GB/$5.99 to 25GB/ $99.99 per month). Both services are nearly identical, but the professional plans offer multiple PC support and group permissions management.

The iStorage software is a model of simplicity: a large tab to select files to back up, another tab to restore files from the server, and a third tab for system settings. Iomega generally lays out iStorage's commands and settings well, and this makes it easy to back up and restore files. It took iStorage nearly 12 hours to back up my sample file set, but CPU utilization was only 2%, using 25MB of RAM. The initial backup stalled three hours in but finished when I restarted it.

You can share files you back up with others by emailing hypertext links with Iomega's WhaleMail. FTP client access is available now, and Iomega will soon add Windows drive mapping. (iStorage doesn't support non-Windows OSes at this time.) Also, iStorage lets you access the files you back up directly from its Web site, and the site is compatible with Palm and BlackBerry devices.

Berkeley Data Systems Mozy 1.6.4.8

Mozy, currently in a long-lived and stable beta, offers 2GB of free storage for anyone willing to answer some marketing questions, and more storage for very inexpensive rates, such as 5GB for $1.95 per month or 60GB for $9.95 per month. There are a few hidden limitations for free storage (such as the limited number of file restores, more on that later; and to restore your files Mozy has to email you a link and then you manually download your files and uncompress them via this link), but many will consider the limitations worth it.

Mozy is fairly simplistic, lacking even an interactive direct-restore function, but it covers the basics. After scanning your system, it prompts you to save common files, bookmarks, email, and your My Documents folder, and then lets you pick folders you want to back up. The initial backup took 1:36 (hours:minutes), consuming 15% of the CPU and 17MB of RAM.

The Windows version of Mozy (a Mac version is on the way) is incredibly flexible, letting you throttle bandwidth usage or specify CPU idleness before a backup commences. Lots of plain English explains the options, and the online help is well-written.

Restores are only available via the Web interface, but the clean, IE-like directory tree and search engine make finding and restoring files quick and intuitive. In order to keep costs down, you get only five restores per month, making Mozy more of a disaster recovery service rather than a remote hard drive. As I mentioned above, when you restore a file, Mozy prepares a downloadable Zip file and then emails you when it's ready. ▲

by Warren Ernst

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ● ● ◖ 2.5 = ABSOLUTELY AVERAGE | ● ● ● ● ● 5 = ABSOLUTELY PERFECT

The Battle Burns On

Nero 7.5 Ultra Edition vs. Roxio Easy Media Creator 9

Like the office suite and browser wars of yore, the CD burning suite wars have been essentially reduced to two combatants: Nero Ultra Edition and Roxio Easy Media Creator. Ironically, both Nero and Roxio have updated their products, and they can now do far more than simply burn CDs.

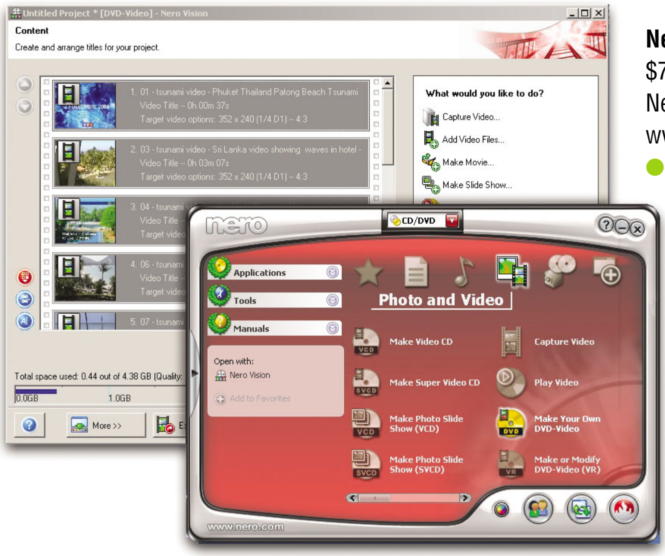
Now that Windows comes with basic "burning" (aka optical media writing) abilities, Nero and Roxio have added features normally associated with other products, such as DVD authoring, audio and video capture and conversion, file and system backup, and more. All of these features add to the price—and some would say the bloat—of these two products, making using them both on the same system expensive and potentially troublesome. I've set out to discover which burning suite is the best for you.

Nero 7.5 Ultra Edition

Nero is the leaner and meaner suite, which is reflected in both its lower price ($20 less than Roxio) and smaller resource footprint, and it only installed two startup apps and one Windows service on my PC. The installer did automatically install DirectX 9.0c on my computer, however. Although it does less than Roxio, it still does more than ever before.

You can access various Nero programs via its SmartStart launcher (in addition to the Windows Start menu). These programs are grouped by tasks, such as Photos And Video, Audio, Data, and so forth, but you can't resize the window, so it sometimes feels small and overstuffed with icons. An alphabetical list of all the Nero applications and a CD and DVD task selector (which thins out the launcher's icons) are also available. Tool tips help you keep the various apps straight.

The "classic" tools (Nero Express, Nero Burning ROM, and Nero Vision) are all still here, but Nero has updated them so that they can burn Blu-ray and HD DVD discs (ditto for Roxio's Easy Media Creator). Even though Roxio's Media Creator lets you specify different gaps between individual tracks, creating "gapless" audio CDs is an all-or-nothing affair with Nero. In many ways this is typical of the different operating philosophies between these programs: Roxio's Media Creator usually has more options, but they tend be less useful in the real world.


Untitled Project * [DVD-Video] - Nero Vision
Content
Create and arrange titles for your project.
1. 01 - tsunami video - Phuket Thailand Patong Beach Tsunami
Video Title -- 0h 00m 37s
Target video options: 352 x 240 (1/4 D1) -- 4:3
2. 03 - tsunami video - Sri Lanka video showing waves in hotel -
Video Title -- 0h 03m 07s
Target video options: 352 x 240 (1/4 D1) -- 4:3
3. 04 - tsunami
4. 06 - tsunami
5. 07 - tsunami
What would you like to do?
Capture Video...
Add Video Files...
Make Movie...
Make Slide Show...
Total space used: 0.44 out of 4.38 GB (Quality:
0.0GB
1.0GB
More >>
nero
CD/DVD
Applications
Tools
Manuals
Open with:
Nero Vision
Add to Favorites
Photo and Video
Make Video CD
Capture Video
Make Super Video CD
Play Video
Make Photo Slide Show (VCD)
Make Your Own DVD-Video
Make Photo Slide Show (SVCD)
Make or Modify DVD-Video (VR)
www.nero.com

Nero 7.5 Ultra Edition
$79.99
Nero
www.nero.com
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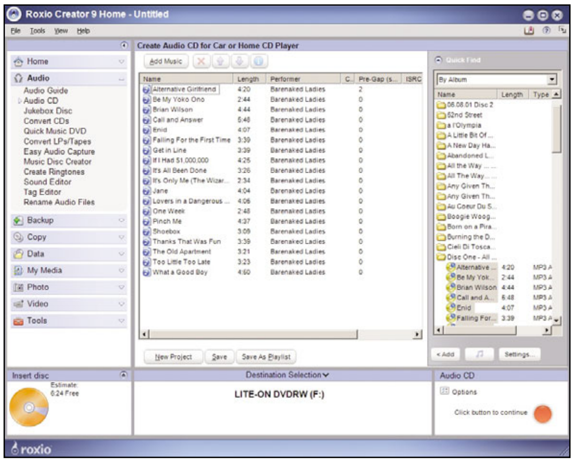
Nero can't copy copy-protected DVDs (nor can Media Creator), but it can import video from a DV camera, a non-protected DVD, a TV tuner card, and other analog video capture devices. You can reconvert such video into a portable-friendly format (for a PSP, video iPod, or smartphone) and "broadcast" it to another Windows Media-equipped PC or Xbox 360 on your LAN or burn it onto a DVD (complete with menus, chapters, and so forth). The DVD authoring tools are straightforward to use and filled with useful tool tips, but all of this feels somewhat basic. Budding filmmakers may want to look elsewhere, but Nero's tools will get the job done for the rest of us.

System and file backup are now major components of both products, and Nero's BackItUp 2 program has many sterling qualities, yet it possesses a potential Achilles' heel. As to be expected, BackItUp 2 lets you select files, specify a backup destination (usually optical media, but network and external storage options are available), and set a schedule. You can also back up drives and partitions, including the active Windows partition. Although backing up Windows from Windows is usually a no-no, BackItUp 2 managed the job without error, but restoration was tricky. Nero can burn a bootable backup/restoration disc (based on Linux), which is a very good idea; however, it always froze in the middle of the restoration job on one of my test computers when using DVDs. Unreliable system backups are worse than no backups at all.

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT



Roxio Easy Media Creator 9
$99.99
Sonic Solutions
www.roxio.com
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Roxio Easy Media Creator 9

Roxio Easy Media Creator 9 is so filled with features and abilities that merely listing all of them would take four paragraphs, so I'll just say that it does everything Nero does, plus more. (Check out Roxio's and Nero's Web sites for a full list of features of each product.) However, even on a reasonably fast computer, Media Creator seems to respond to every click with an almost imperceptible hesitation. Perhaps the five services and three startup applications it installed on my PC (along the .NET Framework 1.1) were to blame.

Roxio's main program launcher, called the Home window, is actually much more than it appears. The Home windows looks like a pastel version of the iTunes store. It lists categories of applications on the left of the window (such as Audio, Video, Data, etc.), and hypertext links that actually launch applications are on the right along with app descriptions, up-to-the-minute tips, and links to Roxio's Web site. Some of the applications replace the right-side hypertext links directly, giving a more cohesive feeling to the whole package.

The "classic" Creator program is still available, dressed in spring pastels to match the Vista-hued themes of the other applications, but surprisingly, many apps act very differently. Many components, such as the Slideshow Assistant, are essentially comprehensive wizards, guiding you through complex tasks step by step. Other components appear as standalone applications, so you're basically on your own. The look is unified, but the feel certainly is not.

DVD authoring and video- and audio-editing tools rival standalone products, possibly because Roxio integrated versions of its standalone products such as MyDVD, VideoWave, and CineMagic into Media Creator. Though more complex, these products offer greater control, more options, and generally feel more substantial than Nero's counterparts.

Like Nero, Media Creator can capture, convert, and "LAN-cast" videos to other Windows devices, in addition to creating DVDs. Interestingly, Media Creator's DVD played back more smoothly for me with only occasionally visible pixels. In contrast, Nero's DVD had sharper picture quality, but there were visible "stutters" during panning scenes. (I burned both DVDs with the same sample videos at "highest" quality.) Unlike Nero, Media Creator consumes virtually 100% of the CPU during intensive rendering, making the PC otherwise unusable.

Media Creator's backup program is a version of Sonic's BackUp MyPC, as it feels comprehensive and substantial. Well-suited to backing up data files to DVDs, external media, and network resources, it's probably best to think twice before using BackUp MyPC to back up your Windows drive because restoring it requires reinstalling Windows, then Media Creator, and then restoring your backup. Additionally, it requires backing up and restoring Windows from within Windows, which is usually problematic, but amazingly, it worked fine for all of my test machines.

And The Winner Is . . .

Both Easy Media Creator 9 and Nero 7.5 Ultra Edition are comprehensive burning and media management products. For older PCs, Media Creator's bells and whistles are a substantial performance drain, making Nero Ultra Edition a clear choice for most beginners and power users alike that appreciate speed and performance. However, for those super-creative users who would benefit from Media Creator's more flexible authoring and media-editing tools and who have brand-new PCs, Media Creator is an exceptional value despite its higher price, and so it gets the additional half CPU. ▲

by Warren Ernst

Don't Need The Kitchen Sink?

If you're just looking for no more options than Window's own CD Writing Wizard, these products may seem like overkill. What to do?

Both Nero and Roxio have slimmed-down OEM versions of these software packages, which you can find bundled with many optical storage drives. These versions generally lack the audio/video capture, movie editing and conversion, DVD creation, and automatic backup functions of the full versions I reviewed but have a similar interface and workflow. If you like one of these products, consider a new drive that comes with one of the OEM versions.

If you've already got a drive, there are many free tools for Windows that can do most burning basics. ISO Recorder (isorecorder.alexfeinman.com) is a free Windows Power Tool that creates ISO files from CDs/DVDs and conversely makes discs from ISO files. Both DeepBurner Free (www.deepburner.com) and CDBurnerXP Pro (www.cdburnerxp.se) offer comprehensive burning tools, such as options to make multisession and bootable CDs and gapless audio CDs, and can even rip audio CDs into MP3s but lack video DVD creation tools. ▲

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Movavi VideoSuite Edition 3.1

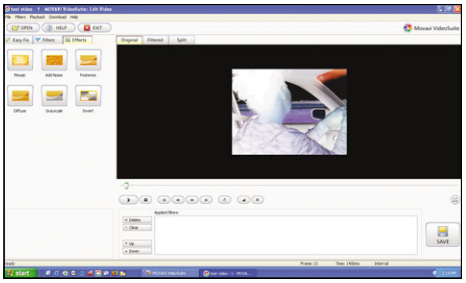
by Blaine Flamig

Sometimes, it takes a software company from across the ocean to give a typical American user what he wants in a program: something that just works in a hurry without a lot of hassle. VideoSuite Edition 3.1, from Novosibirsk, Russia-based Movavi, is six such programs. The "digital aficionados" who started Movavi just two years ago describe their development strategy as "making video editing and processing as simple as brewing coffee or using a blender." Using VideoSuite isn't quite that easy, but it's close.

Where video is concerned, if you're mostly interested in quickly putting decent-looking video up on YouTube, converting and transferring video to an iPod or PSP (with custom settings), or creating bare-bones movies with few bells or whistles, this suite excels. If you want to output your own Scorsese masterpiece, look elsewhere. VideoSuite doesn't offer the kind of fine-tuning and tweaking you'll need. The editing options are primarily limited to just 11 filters; six effects; automatic contrast, saturation, and white balance settings; and a Magic Enhancer tool.

Conversely, the program's interface is wonderfully straightforward, with just six buttons that point to common video-related tasks. Categories cover creating a CD/DVD, converting video (not encrypted/copy-protected data, however), transferring video to a mobile device (iPod, PSP, cell phone, PDA), editing video, splitting video, and joining videos. Although saves between changes on a 2.4GHz Athlon 64 3700+ rig (Windows XP, 80GB hard drive, 2GB of RAM) were frustratingly long at times and edited video outputs to just AVI, MPEG, and WMV files, each of VideoSuite's tools are good choices when you don't want (or need) to invest much time or effort into the final product.

You can output converted video to the usual file formats, plus 3GPP and 3GPP2 files, and if you get stuck, the Help section is among the best I've seen. You can also extract songs from soundtracks fairly easily, and the minimum usage requirements (1.5GHz-plus CPU, WinXP/2000, 256MB of RAM, 1GB hard drive space) aren't too demanding. Overall, VideoSuite is friendly enough for your parents to use (and stop bugging you) but hearty enough to give you six right-to-the-point apps for about $10 each. ▲



Movavi VideoSuite 3.1
$59.99
Movavi
www.movavi.com
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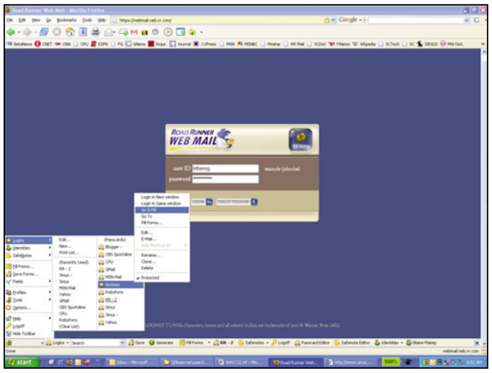
Siber Systems RoboForm2Go 6.7.9

There's a good chance you already use the well-regarded RoboForm. Siber Systems claims it's been downloaded over 11 million times, and the password-manager, form-filler, and much-more program is excellent at what it does. A mobile Pass2Go version has been available for some time, but it's recently been rechristened as RoboForm2Go with added U3 smart drive support.

In short, RoboForm stores passwords and other data with AES, RC6, and Blowfish encryption and uses this data to automatically fill in online forms, logins, passwords, and more. It then attaches a toolbar to Internet Explorer (I also used it with Firefox via a plug-in). When you enter login information at a site, RoboForm asks if it should save the data for automatic logins later. You can activate an automatic login via a Fill Forms menu or an even-quicker Logins drop-down menu. Robo-Form can also generate alphanumeric passwords, save Safenotes (offline information), and create Identities (work vs. home, for example). An encryption-protected Master Password protects your Identities. Logging off RoboForm purges the password from memory, or you can set a purge to occur after specified time of inactivity.

Now, make all this functionality accessible from a USB key drive and you understand RoboForm2Go, which you can download to your own key drive or buy preinstalled on a 256MB unit ($9.95) from Siber Systems. If you're already running RoboForm, RF2G copies your passwords, URL, etc. when plugged in. If not, you can install from the key drive. Plug the drive into a different system, say at an Internet café, and RF2G starts without an install required. You access RF2G from the browser toolbar or System Tray icon, and when you pull the key drive, your passwords and data go with it, leaving nothing behind.

Mastering RoboForm takes some time, but using the passwords feature alone is a noticeable time-saver over a day's time. Easily moving RoboForm's functionality among computers is icing on the cake. There's no Mac support, but I used RF2G on four systems with the only obstacle being the needed Firefox plug-in. ▲



RoboForm2Go 6.7.9
$39.95 (optional 256MB key drive $9.95)
Siber Systems
www.roboform.com
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CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ● ● ◖ 2.5 = ABSOLUTELY AVERAGE | ● ● ● ● ● 5 = ABSOLUTELY PERFECT by Blaine Flamig

Paragon Software Group Partition Manager 8.0 Personal Edition

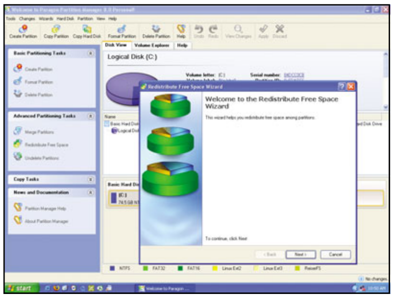
The last time we tested Partition Manager (January 2006 *CPU*, page 77), we liked what it offered. This version adds interface tweaks while maintaining its thorough functionality. Moving forward, it's not difficult imagining PM becoming a top-shelf product if Paragon stays the course.

Installation was a snap, but PM defaults to share with all system users, so beware. Otherwise, the GUI has a Windows XP feel that's all about accessibility. Three center panes provide various views of your drives, plus Disk View, Volume Explorer (very handy), and Help tabs. At left are four panes containing basic and advanced functions, plus tools for copying drives or partitions. Nine buttons at top and right-click menus offer even more launching pads.

Creating partitions was as easy as using a wizard or right-clicking unallocated drive space. Wizards are PM's tool of choice; there's seemingly one for every task, including nondestructively redistributing free space and formatting, deleting, merging, undeleting, and copying partitions. Advanced features also abound, including a mode in the Partition Wizard to create a partition as something other than the last primary partition or the last logical drive in an extended partition. Many tasks didn't require a reboot, and PM was excellent at confirming actions I was about to start and their consequences.

Testing on a 3.2GHz Intel P4 WinXP system with a 150GB Seagate drive and on an Athlon 64 3700+ WinXP rig with an 80GB Western Digital drive went flawlessly. Multiple 20GB partitions I created took about 20 minutes each, and PM's tools for splitting, merging, and adjusting free space were straightforward. Defragging, deleting, and creating recovery media also went off problem-free. If you're experienced using hard drive utilities, you'll have little problem using PM. Some midlevel users, though, will likely need PM's fine Help system for some clarifications and guidance.

PM comes in Personal, Professional, Server, and Enterprise Server editions and supports FAT16/32, NTFS, Ext2/3FS, Linux Swap, and HPFS file systems. New to this version are better email notifications and support for Windows x64 OSes. ▲



Partition Manager 8.0 Personal Edition
$49.95
Paragon Software Group
www.partition-manager.com
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InterVideo iVideoToGo Platinum

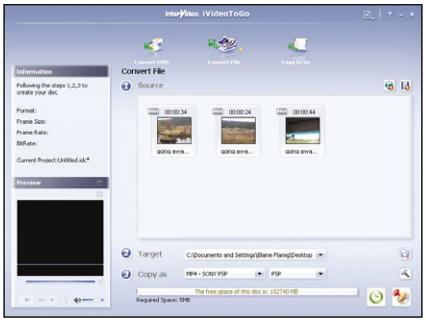
You don't buy a program like iVideoToGo because it can transfer video to an iPod or PSP. A growing number of programs offer this ability. You buy such a program for how quickly it does this, as well as its price, how it handles, and what else it offers. At $29.95, iVTG is no lemon.

Like Partition Manager's installation, iVTG's raised one gripe, namely an invitation to anonymously transfer data to InterVideo's Information Service Program that was defaulted to yes, as well as a Google Desktop installation. I appreciate the offers, just not the assumption my answer is "yes." Otherwise, testing went smoothly on a 3.2GHz Intel P4 WinXP system with 1GB of RAM and 150GB drive and an Athlon 64 3700+ WinXP system with 2GB of RAM and 80GB drive.

If you've used InterVideo's PowerDVD or other software, you have an idea of how iVTG handles. iVTG claims to put video on your portable device in three easy steps, which it does. Convert DVD, Convert File, and Copy To Go buttons get you started. Say you want to convert a DVD to MPEG-4 video to put on an iPod. Just select the source drive (copy-protected DVDs won't work), destination folder, and format (MPEG-4 or H.264 variations). It's that easy.

I converted a 4.07GB 1:07 (hour:minutes) DVD to a 309MB 320 x 240 MPEG-4 iPod video in under 40 minutes on the AMD machine. The same DVD converted to a 196MB 320 x 240 MPEG-4 PSP video in less than 30 minutes. When iVTG finished, it offered to transfer the video right away to the player. If you don't, iVTG conveniently makes the video available from Copy To Go, where you can configure transfers for later (handy for overnight copying).

iVTG handles ASF, AVI, DivX AVI/Media, DVR-MS, MPG, WMV, and other files. You can adjust file sizes up to 512 x 384 (quality expectedly suffered in my tests, though), preview video, create chapters, download Web videos from within iVTG, and trim clips. Importing and batch converting individual files was a breeze, but you'll want to edit your video elsewhere, as iVTG's strength is performing easy and quick transfers. ▲



iVideoToGo Platinum
$29.95
InterVideo
www.intervideo.com
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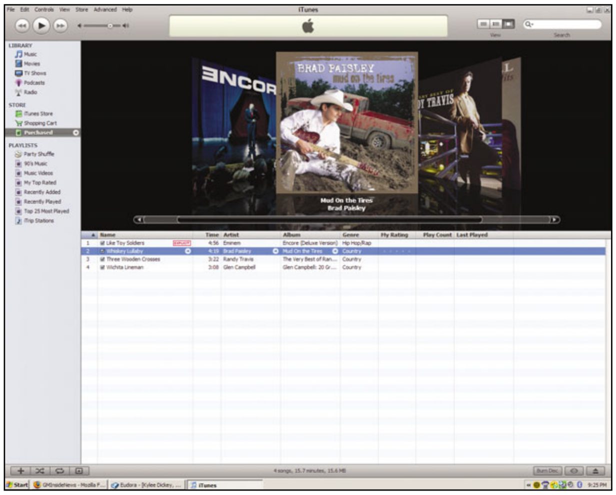
Apple Computer iTunes 7



	Name	Time	Artist	Album	Genre	My Rating	Play Count	Last Played
1	Like Toy Soldiers	4:56	Eminem	Encore (Deluxe Version)	Hip Hop/Rap			
2	Whiskey Lullaby	4:19	Brad Paisley	Mud On the Tires	Country			
3	Three Wooden Crosses	3:22	Randy Travis	The Very Best of Ran...	Country			
4	Wichita Lineman	3:08	Glen Campbell	Glen Campbell: 20 Gr...	Country			

4 songs, 15.7 minutes, 15.6 MB

iTunes 7
Free
Apple Computer
www.apple.com/itunes
● ● ● ●

iTunes 7 is a major upgrade to Apple's ubiquitous media player/organizer app, adding many new tools and features. As you probably know, one of the most hyped additions to iTunes 7 was support for full-length movie purchases from the iTunes Store. However, that addition hardly scratches the surface of what you'll find in iTunes 7.

Presentation Is Everything

iTunes is now much easier to navigate, thanks to a redesigned Source List. The Source List still resides in the left pane, but instead of presenting sources in a long list, you'll now find media sources grouped under category headings such as Music, Movies, TV Shows, Store, Devices, Shared, and Playlists.

iTunes 7 also sports a new Cover Flow view, which lets you visually flip through the cover artwork for your music, TV shows, and DVDs. Some may find this view little more than a gimmick, but veteran music collectors will probably enjoy having the same type of visual interaction with iTunes media that they've long had with their CD and vinyl collections.

Although items you bought from the iTunes Store included cover art in iTunes 6, tracks that you ripped from your own CD collection didn't have artwork unless you either scanned album covers yourself or found third-party software that could search for missing artwork online. iTunes 7, however, can handle artwork acquisition for you. If you have an iTunes Store account, just click the Advanced menu and Get Album Art.

iTunes 7 also offers a much-improved video-viewing experience. iTunes videos are now available at a 640- x 480-pixel resolution rather than the previous 160 x 120 option. You probably won't notice the difference on your iPod's LCD, but if you watch videos on your PC or connect your iPod to a TV, you'll see a significant improvement.

New To iTunes

iTunes 7 adds many new features that are central to the iTunes Store. For example, iTunes 7 can manage content that you download from the iTunes Store's new Games category. These games cost $4.99 each, are compatible with 5G iPods, and include offerings such as Tetris and Pac-Man.

As mentioned for full-length movie support, the iTunes Store carries Disney movies for $12.99 the week of release or from $9.99 to $14.99 afterward. You can even preorder unreleased movies, and iTunes will notify you when the movie is ready for download, which I like much better than signing up on Netflix and waiting in a long queue after a DVD's release.

Even with a broadband connection, it takes about 30 minutes to download a movie. This is quite a wait, but if you want you can start watching a movie while the remainder downloads in the background. Also, iTunes 7 has a Download Manager that lets you select the order in which iTunes should download the media that you buy.

You can now transfer media from your iPod to an iTunes Library on any of your authorized computers. Before, you could only sync from iTunes to your iPod. There is one caveat, however. You can only transfer media that you bought from the iTunes Store back to a computer, but it's nice to see at least some loosening of iTunes' DRM.

iTunes 7 has a new iPod Summary page, which shows you what percentage of your iPod's drive is consumed by various types of content. You can also set storage limits on that page. For example, you can dictate that no more than half of the drive's capacity should store videos. You can also update your iPod's software from the iPod Summary page. In the past, you had to download and install iPod updates manually.

iTunes 7 also has a Back Up To Disc menu for creating a backup of your entire iTunes Library. iTunes calculates how many files will fit on each disc, burns the disc appropriately, and prompts you to insert the next disc.

Before You Upgrade

Although I was very impressed with iTunes 7's new features, a variety of bugs are well-documented in Apple's iTunes For Windows support forum, iLounge's iTunes (Mac + PC) forum, and other online discussion groups. Hopefully, these bugs will be fixed by the time you read this, but I'd strongly recommend backing up your iTunes Library and any other important files before upgrading to iTunes 7. However, if your iTunes 7 installation goes as smoothly as mine did, you should find the program's many new features well worth the upgrade. ▲

by Kylee Dickey

The Greatest Gift Of All

by Chris Pirillo

Knowledge.

So now that I've given you the answer, I have to fill the rest of this page with the explanation.

I look forward to this time of year, every year—the sounds, the sights, the nostalgia, the PRESENTS! Oops, 'tis not the season to be grabby. Instead, it's time for you to get a little gabby. Stop stuffing stockings with packs of 5-1/4-inch floppy disks! To all of your friends and family who are getting either new computers or Internet connections, please impart a few words (and gestures) of wisdom.

Bookmark Snopes.com for them. I swear, if I get another one of those "Mars is going to look as big as the moon next week" emails, I'm gonna go postal. Explain to them that they should always check for potential hoaxes here first.

Don't send money to princes in Nigeria. No, seriously, I've seen bank forms with checkmarks next to similarly labeled options. At least certain financial institutions are taking a proactive approach to stopping this kind of thing from happening. Now, emails requesting money transfers to Chris Pirillo are perfectly legit.

Watch out for unwarranted attachments. Many email programs will strip questionable file types automatically, but you can't be too careful. Even when you're expecting a file to come through, consider establishing a memorable safeword (or phrase) to assure that the transmissions are valid. ("Virus" and "Worm" are not good safewords, by the way.)

Cut, copy, paste, undo. 10-to-1 odds says that half the people in your inner circle have no idea they can perform simple commands by either right-clicking or using designated keyboard shortcuts. You have to at least cover these relatively universal "big four" functions. Explain what a virtual clipboard is, and how/where they might use it.

If the plugs don't fit, you simply quit. It's time to explain the whole "square peg won't fit into a round hole" concept. A FireWire outlet can easily be confused for USB, and there's no quicker way to damage a device and its respective port than by jamming it where it shouldn't be jammed. That's not a cup holder; that's not a place for you to stick your pens; and that's certainly not where you're supposed to put your foot.

Introduce the F1 key. It's amazing, most users don't think of using a local help file largely because they don't even realize it's there in the first place. Forget about digging through the menus; just press this button. On some keyboards, F1 is even labeled "Help." If you can't find the answers there, then go to Google, which leads me to my next suggestion.

Set their browser's start page to Google. It's funny to watch someone launch Internet Explorer, click the cursor into a search field, and proceed to enter "google.com," which is even more ironic if their start page is set to MSN or Yahoo! That's how normal people think, my geeky friends. They're looking for Google, so just give it to 'em and be done with it.

Tell them that downloads are from the devil. You have to put the fear of God into somebody to keep them from installing an "amazing" toolbar that will "transform" their computing experience. I don't care if they already have all the latest malware definitions installed. They're going to be tricked into believing that they need to install a patch, upgrade, etc. Set Windows Update to run automatically (if they're not using OS X).

Consider redirecting their DNS settings. I learned about the freely available OpenDNS (www.opendns.com) a few months ago, and it's a great safety net on any network. My fiancée is further protected from phishing attempts and typos, and she gets a small DNS speed boost to boot. There's no software to install and nothing to configure beyond setup. With as many PayPal scams as I see in my inbox on a daily basis, this is a must-do (or at least put it under heavy consideration).

With any luck, these infonuggets will cut down on your personal tech support calls by a factor of 10. That's not a scientific number, but I read about it on the Internet, so it must be true. ▲

Holiday Wish List:

1. World peace
2. True instant messaging platform interoperability
3. The death penalty for spammers and spyware vendors
4. An end to DRM
5. Windows Vista Visual Service Pack 1
6. OS X on non-Apple hardware
7. A mobile communications company that doesn't suck
8. Full U.S. government disclosure on UFOs and ETs
9. More friends who aren't on MySpace
10. A public apology from George Lucas for all three prequels

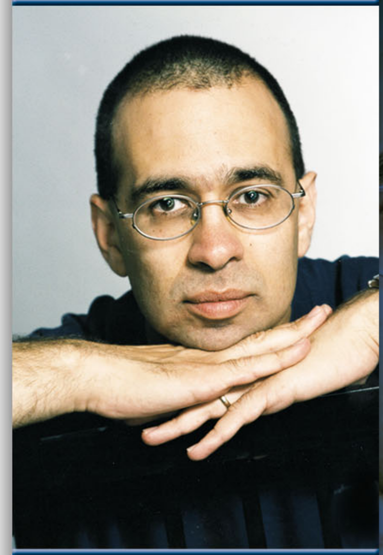
That's how normal people think, my geeky friends. They're looking for Google, so just give it to 'em and be done with it.

You can dialogue with Chris at chris@cpumag.com.

Open Sauce

Need & Want

by Pete Loshin



Waiting can be a pain, but anticipation is a pleasure. The frustration of waiting for a desperately needed patch or upgrade when you're stuck with broken software can be as painful as the delight of anticipating desired new features and functions in an upgrade to an already reliable program is pleasurable. Having experienced both the pain of waiting for fixes to proprietary software and the pleasure of anticipating upgrades to open-source software, I'll choose want over need any time.

Go ahead and wait for Vista; I'm looking forward to my next Linux upgrade. Not that there's anything wrong with the distro I'm using now (SuSE 10.0), but it has outdated versions of both popular desktop environments, KDE (www.kde.org) and Gnome (www.gnome.org).

The latest Gnome, 2.16, features dishy new features that make SuSE 10.0's Gnome 2.12 look sick and KDE 3.4.2 look worn. With all the software incorporated into and used by desktop environments, they're often tricky to upgrade on your own. But having tried Gnome 2.16 on Ubuntu Linux 6.06 (www.ubuntu.org), as soon as OpenSuSE 10.2 goes beta, I'm upgrading.

Gnome 2.16 offers advanced 3D effects for more/better desktop eye candy, new icon sets for a cleaner look, improved power management tools for laptops, enhanced menu editing, and lots of nifty little usability improvements. Also, two neat new applets, including the one thing in Gnome 2.16 I ache for: Tomboy (www.beatniksoftware.com/tomboy/), for note-taking. Sure, the other new applet, Baobab (www.marzocca.net/linux/baobab.html), simplifies disk usage analysis so you can easily spot space-hogging files on your drives even when they're embedded in endless subdirectories and monitor your home directory for unauthorized file changes, but I'm upgrading for Tomboy.

I like that Tomboy lets me manage all my notes as a sort of wiki, handling the details of saving and storing data. And it's all done automatically. Notes are marked up as XML files, and links are activated to keywords as soon as you create a new note. Highlight text you want to serve as note title, then right-click for a pull-down to create a note. In just a half-hour of using it to make task lists and take notes for this article, Tomboy proved itself indispensable.

For now, though, I'm still using KDE 3.4, despite last year's release of KDE 3.5. I'd have switched already if the fixes and new features were sufficiently compelling, but I'm happy enough moving to Gnome 2.16. But that doesn't mean there's nothing from KDE to anticipate with pleasure: The just-announced vision for KDE4.

Taking the name Plasma (plasma.kde.org), KDE4 may represent a major step for GUI desktop computing. If it works as promised, Plasma could transform the desktop from a fancy file manager into a far more useful, usable, and extensible GUI.

Most desktops are flat panels on which we arrange icons representing files, folders, program launchers, and active programs, all of which you can select and manipulate with the mouse and keyboard. Plasma intends to extend the way users interact with system resources through windows elements—things like application panels, icons, desktops, drop-down menu bars, and more.

The vision for Plasma is to encapsulate increasing levels of detail into these window elements. You can zoom in on specific resources when necessary and have them shrink back down into the background when you're done.

For example, you might have a menu bar panel that opens a set of extenders—windows elements—when selected; clicking an icon labeled "To Do" might display extenders showing simple lists, notes about documents to be completed, buttons to click to open files needed to complete a task, and other relevant elements.

If that's not entirely clear, neither is KDE: As of this writing, they're still fleshing out their vision for Plasma, and I wouldn't expect a usable release much before the end of 2007. But it does give me something to look forward to, even after I've upgraded to Gnome 2.16. ▲

You can get saucy with Pete at pete@cpumag.com.

Holiday Wish List:

1. *An end to software patents, abusive application, and enforcement of intellectual property law, and a return to a reasonable copyright period.*

2. *A good babysitter who can handle my kids.*

3. *Enough room in my backyard for a cozy little cabin for my office/workshop/etc.*

4. *The cabin (see #3).*

5. *A truly silent PC for less than $300.*

6. *A truly compact PC for less than $300.*

7. *That #5 and #6 be the same PC.*

8. *A nice, big (20-inch or bigger) flat-panel monitor.*

9. *Someone to take away my 100lb. Sony Trinitron Multiscan 400PS to make room for #8.*

10. *A good quality, reasonably priced, (not from Microsoft!) ergonomic keyboard kept in stock at the big box stores and that doesn't change layout or design every three years.*

The Power Of Ajax

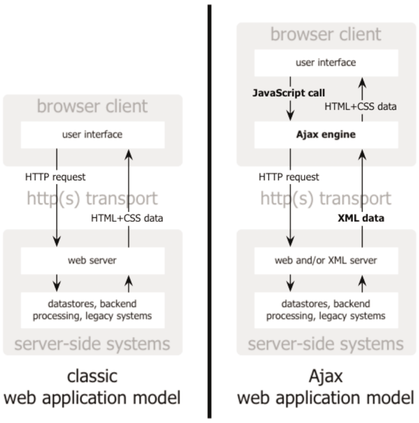
Applications Come To The Web

Remember the first time you clicked a Google map and gasped when it shifted beneath your cursor? Before this moment, the Web page had to fully reload for you to move around in an online map. For a similar bit of wizardry, try Yahoo!'s email: It works like Outlook itself. Or, check out Google's Writely or Ask.com. This is precisely the point of the Ajax (Asynchronous JavaScript and XML) programming techniques that sit behind these and a growing catalog of Web-based applications and gadgets. (See sidebar "Mighty Ajax Flexes Its Muscles" for more applications.) Web browsers are fast becoming homes to fully dynamic applications that look and feel like standalone computer programs: spreadsheets, word processors, and even image editors. Ajax was a term coined in early 2005 by Jesse James Garrett, president of Adaptive Path, to describe emerging techniques for updating information on a Web page without reloading the entire page. Traditionally, Web design was a "page-oriented," hypertext publishing tool that used HTML to display a full page of complete information at a time. Clicking any item made a call to the host server and loaded a different version of the page or brought you to a different link. Click-and-wait remains the typical Web experience.

Ajax pulls together a combination of open-source tools that the major browsers already support: page construction languages that include JavaScript, XHTML, CSS, and the DOM (Document Object Model); and data manipulation using XML and XSLT. Much of Ajax relies on a single JavaScript command, XMLHttpRequest, which lets a Web page make repeated calls for more information from the server and display them on-screen without reloading the entire page. The experience on the user end is a fully dynamic Web page, such as Google Maps. The Ajax engine sits between the browser window and the server, so that a user interacts with the screen "asynchronously" without having to send calls to the server with every click or drag.

The Simple Revolution

Although Ajax sounds like a cool programming trick, its implications could be vast and ultimately impact the entire software business. "I really see the way we work changing," says Greg Murray, Ajax architect, Sun Microsystems. Just look at Google's Writely and Google Spreadsheet, the current poster children for Ajax's potential. Most of the formatting and formula calculations available in Microsoft Word and Excel are available here, but the applications and their data are always on and always accessible wherever you can connect to the Internet. As standalone applications grow bigger and more complex, most users never avail themselves of the deeper features. Although Ajax versions of common programs may never be as sophisticated as their Office counterparts, Murray says users are realizing that they only need a basic set of tools in many of their everyday applications.



Jesse James Garrett's article on Ajax programming explains how "asynchronous" Web design creates a layer between the Web page and the server. Users interact with a browser screen while Ajax exchanges info with the server without reloading the entire screen.

Even more important to the success of Ajax may be that Web-based spreadsheets, calendaring, and word processors more easily become collaborative, letting multiple colleagues add, view, and edit material in much the same way they might contribute to a wiki. To Murray, this is the essence of that amorphous Web 2.0 vision. For years, developers dreamt that computing power, storage, and applications could move off the desktop and reside more safely and accessibly online. In this vision, the Web becomes a computing resource that you turn on as needed.

Ajax Muscles Up

The best way to understand the potential of the Web-based applications that Ajax and other new design techniques make possible is to see them in action. Try the flexibility of spreadsheets such as Num Sum (www.numsum.com) and iRows (www.irows.com), where you can turn a spreadsheet into a group data chart that you can share via email or RSS feeds. Or try Backpack (www.backpackit.com) where you can weave together calendars, alert systems, photo libraries, and to-do lists and share them via the Web and even cell phone reminders. Or, if you want to see the full collaborative power of having a real-time, Web-based white board for group brainstorming, try Virtual Whiteboard (www.virtual-whiteboard.co.uk/home.asp).

Q&A

Jesse James Garrett: "Inventing" Ajax

Jesse James Garrett, president of Adaptive Path, didn't actually invent Ajax, but he's considered the "father" of the techniques. On Feb. 18, 2005, his essay "Ajax: A New Approach to Web Applications" named this emerging discipline of asynchronous Web page updating and explored some of its possibilities. Nearly two years later, Garrett tells *CPU* he's just as concerned now with Ajax's excesses as he is with its strengths.

CPU: How did you discover Ajax techniques and decide to compose that now well-known article?

Garrett: We had been working on a project for an insurance company and found that the response rate for the application insurance agents used to process policies was a potentially significant competitive advantage. To deliver that level of responsiveness we hit upon this group of technologies being used in a particular way. We realized that others could benefit from this, but we needed to encapsulate the concepts.

CPU: Why do you think Ajax has taken off so quickly now?

Garrett: I think a big part of the credit for that is the fact that none of the technologies are proprietary. They are free for anyone to use. I think the reason it has taken so long for the dream of the Web to really come to fruition is that all of the solutions to this problem historically have been proprietary.

CPU: What role do you play in the Ajax movement now?

Garrett: People expect me to be more of an Ajax booster, but among the possibilities there can be a good number of pitfalls, a lot of ways that Ajax can be misused. People have been experimenting with loading other Web pages and content elements without leaving the Web page you are on. But it breaks the browser in a lot of ways; then the History and Back buttons don't work right. It breaks a lot of people's expectations about how they would navigate.

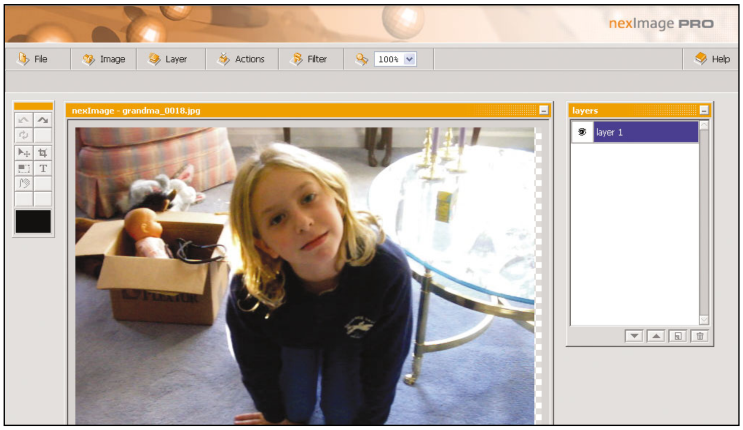
CPU: When done well, how can Ajax move computing forward?

Garrett: I think that in a lot of ways Ajax is the point at which the Web reaches maturity and starts to fulfill a lot of dreams that people had about the Web, about client computing, and network computing. It means that applications we might never have thought of as something you would want to do on the Web become possible. You can look at almost any piece of software on your computer right now and ask yourself, would this be better at a Web site? There are a lot of possibilities.

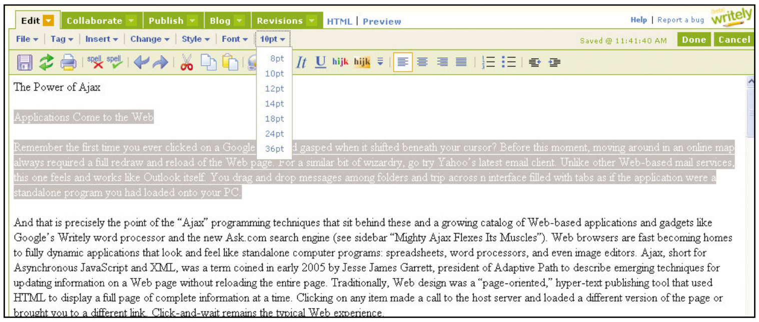
To glimpse a true next-generation attempt at bringing image editing online, go to nexImage (demo.neximage.com) to manipulate image layers in a Web browser. Or if you want to rifle through some of the best examples of Ajax experiments and beta projects, check out the Ajax Patterns site (ajaxpatterns.org/Ajax_Examples).

And some of the biggest companies in computing would very much like to see even more PC processes migrate to the Web because that's where their money and businesses reside. In the wake of Garrett's landmark article on Ajax, both developers and major software and online entities have rushed to support this new effort to evolve the Web from a content delivery system to a place for RIA (Rich Internet Applications). Corporate supporters of the OpenAjax Alliance (www.openajax.org) reflect the range of companies that have a stake in this project: Sun, Mozilla, IBM, Google, Adobe, and more.

The company that may have the most to gain from Web-based computing is Google. In addition to Writely and its own spreadsheet and calendaring programs, the search giant recently released a series of "gadgets" that interact dynamically with search, video, mapping services, and even games. Many in the industry believe that Ajax is a key weapon Google is using on Microsoft and its dominance of the desktop. By undermining our reliance on Windows, Outlook, and Office, the search engine gets us to spend more time in the Google-verse of replacement applications and the highly profitable advertising that supports them. The threat to the traditional



The nexImage site is so sophisticated it lets you add and edit image layers in a browser.



The Power of Ajax

Applications Come to the Web

Remember the first time you ever clicked on a Google d gasped when it shifted beneath your cursor? Before this moment, moving around in an online map always required a full redraw and reload of the Web page. For a similar bit of wizardry, go try Yahoo's latest email client. Unlike other Web-based mail services, this one feels and works like Outlook itself. You drag and drop messages among folders and trip across n interface filled with tabs as if the application were a standalone program you had loaded onto your PC.

And that is precisely the point of the "Ajax" programming techniques that sit behind these and a growing catalog of Web-based applications and gadgets like Google's Writely word processor and the new Ask.com search engine (see sidebar "Mighty Ajax Flexes Its Muscles"). Web browsers are fast becoming homes to fully dynamic applications that look and feel like standalone computer programs: spreadsheets, word processors, and even image editors. Ajax, short for Asynchronous JavaScript and XML, was a term coined in early 2005 by Jesse James Garrett, president of Adaptive Path to describe emerging techniques for updating information on a Web page without reloading the entire page. Traditionally, Web design was a "page-oriented," hyper-text publishing tool that used HTML to display a full page of complete information at a time. Clicking on any item made a call to the host server and loaded a different version of the page or brought you to a different link. Click-and-wait remains the typical Web experience.

The penultimate expression of Ajax programming is Google's Writely, originally written by a trio of programmers to up much of the power of Word in a browser window.

software ecosystem could be profound. One of the key benefits of Web-based applications is that a single, centralized source that everyone can upgrade on the fly is serving the software. Say goodbye to the perennial and costly software upgrades that made Bill Gates so wealthy. New features could be added on a weekly basis, and everyone working with a program has the latest version.

Beyond The Whiz-Bang

For anyone accustomed to the flat, page-oriented Web experience, a good Ajax program is a "gee-whiz" revelation. But as developers explore the limits of these technologies, frayed edges still show. Garrett says that there's altogether too much bad Ajax programming going on today as too many programmers become enamored of Ajax tricks and apply them everywhere. He says the approach is good for Web-based applications, but when you apply this to basic content delivery, Ajax just tends to confuse people. If you feed dynamic content into a frame within a Web page, for instance, a user's habitual urge to click the Back button on the browser will take him back to the previous site he visited, not the previous content in the Ajax-powered frame. The browser was invented to view content, and its architecture does a good job of it, says Garrett, so Ajax developers should stick to making genuinely useful applications that rely on their own interfaces within a browser page.

Murray points out that the strength of Ajax programming, universal access via the Web, is also its chief weakness. When both data and applications are on the Web, then a PC without a Web connection becomes useless. The next stage in Ajax development will try to manage these issues by storing some data on a local PC and maybe creating applications that can switch between desktop and online modes. Also critical to these more collaborative tools will be determining and securing access rights: who gets to view, share, and edit your work.

But the real future of Ajax may reside in the future of the browser itself. Garrett thinks that Ajax may just be a transitional approach to a problem that Mozilla and Microsoft may try to solve by building into upcoming versions of Firefox and Internet Explorer the power to interact with servers asynchronously. Ajax has opened up a new set of possibilities that could turn the Web browser into a desktop environment. Imagine, for instance, a version of Firefox that works like Windows, with dedicated panes for your online email, calendaring, and paint programs. Imagine if your browser tab windows had cut and paste routines that were as versatile as they are across Word, Excel, and PowerPoint in Microsoft Office. Ultimately, as Garrett says, "It will be interesting to see how the browser makers respond to these opportunities." CPU

by Steve Smith

Mighty Ajax Flexes Its Muscles

Anyone who has used a Google map has experienced Ajax programming, but that's small potatoes compared to what some developers have been exploring.

Writely (www.writely.com): The pinnacle of Ajax programming, and recently acquired by Google, puts most of the functionality of Microsoft Word in a browser.

Google Gadgets (www.google.com/webmasters/gadgets): From maps to calendars, games to search results, these Ajax widgets are dynamic applications that sit on your personalized home page.

Ask.com: The redesigned search engine is heavily Ajax-ed out, with preview windows of search results, sliding menus, and super-cool maps that let you find addresses by pointing at a map.

Dojo (www.dojotoolkit.com): Sun, IBM, and others support this site that hosts the open-source toolkit for Ajax, as well as examples of programming.

Script.aculo.us (script.aculo.us): This library of JavaScript routines has many links to a wide range of Web sites with dynamic applications.

Infinite Loop

World's Most Expensive Phone

A man from Russia recently purchased what the Guinness Book of World Records is calling the most expensive cell phone ever sold. At $1.2 million, we think the phone should make us coffee, but what makes "Piece Unique" from Goldvish special is its no-holds-barred, extravagant design. The phone is made of solid gold and encrusted with over 100 carats of diamonds. The customizable insurance policy seems like a must, considering the number of people who drop their cell phones in the toilet each day. ▲

Source: www.goldvish.com

The Department Of Stuff

icasting.txt

by Rob "CmdrTaco" Malda

Apple's success with the iPod has influenced the distribution of music. Record labels are scared as they've seen their profit margins slim down because savvy users can now buy the 99-cent hit single without paying for the 12 filler tracks on a mediocre album. The portability and simple interface finally took us beyond the limitations of a six-CD changer. And now Apple aims to do the same thing with its recently announced iTV box.

The content isn't really ready yet, but most shows currently available price out at about a couple bucks per show. This means that a season of your favorite show could cost you $40 to $50, but most DVD season box sets cost closer to half that. One argument is that you are paying to get your content faster compared to a DVD box set, but we already have a mechanism for that level of distribution: It's called broadcast television. When coupled with a TiVo, even paying a monthly fee for basic cable or a satellite connection, you still get the ability to "buy" dozens of shows for a fraction of the price of the iTV equivalent.

Movies are only marginally better. An HBO subscription would grant you dozens of movies per month for perhaps $10 to $20, depending on your service. Also, those movies could possibly be true HDTV, not the "almost" HDTV that Apple looks to be standardizing for at least the first round of programming on its service.

Likewise, there is a storage problem. When you buy a DVD, you can watch it forever. A hundred movies will rapidly start filling up your hard drive. Because Apple will charge you to download your content again and again, it may force you to limit the number of movies you actually buy.

But there's a more powerful component to all of this that Apple could be in position to capture. The YouTubes and Google Videos of the Internet are growing in popularity. Apple proved that the podcast is a fantastic way to distribute commercial and independent content. The iTV is poised to create an explosion in on-demand, independent video content in much the same way that the iPod, coupled with simple podcasting, has turned anyone with a microphone into his own talk radio broadcaster.

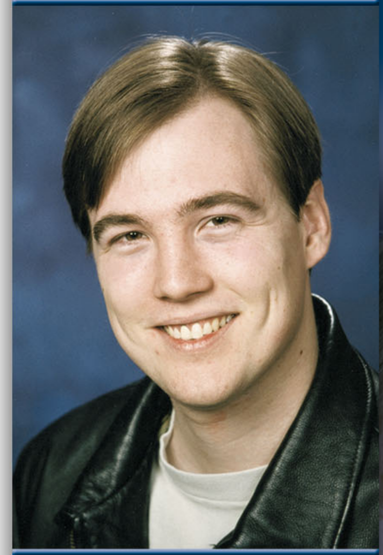
To be sure, there are options that have pulled this off in the past. Anyone with XBMC running on a hacked Xbox can stream videos from the most popular video sites online, but this is a hard step for Joe User. I know many folks who have plugged an old laptop into their TV or created a MythTV media box for streaming their content. But do your parents have that expertise?

I really don't see the average user plunking down a few hundred bucks for something like an iTV and then paying even more money to download each individual episode of "Desperate Housewives." If you watch 15 to 20 shows, your downloaded content will easily double or triple your current cable bill. And your trusty old TiVo will pick up reruns for nothing—old episodes of "The Simpsons" or "Family Guy" are sort of roughage in your TV diet.

But the legions of Mac fans will see this as a new standard to glom onto. And with any luck, a new generation of content will gain acceptance, where users will adopt the independent productions online because they will have more reasonable price structures. Why pay $2 for an episode of "Desperate Housewives" when an entire season of the next big thing might cost you $5? Independent programming does not need to pay superstars huge salaries, and cheap HDTV cameras are coming into the hands of talented people everywhere.

Perhaps the best part of the rise of the iPod is the explosion of independent musicians getting widespread distribution. And when that happens, everybody wins. ▲

Contact me at malda@cpumag.com.



Holiday Wish List

1. Diebold Source Code
2. Final Fantasy XII
3. Sanyo PLV-4 Projector
4. The perfect cup of iced tea
5. 24-inch iMac
6. Portable email that works
7. Standardized downloadable HDTV
8. Gigabit wireless network
9. Lumbar support
10. What he's having

The iTV is poised to create an explosion in on-demand, independent video content . . .

ROAD Warrior

by Jen Edwards

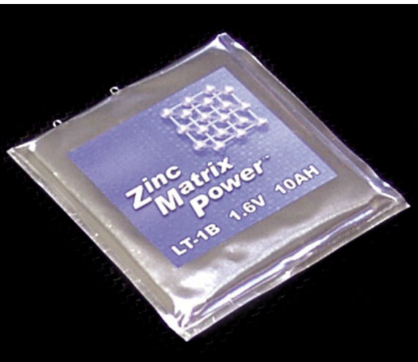
Kensington Offers New Mice, Notebook Cases For Road Warriors

Kensington (us.kensington.com) has expanded its line of accessories with four computer mice and four laptop carrying cases. The Contour Traveler Notebook Backpack ($69.99) includes an Organizer Grid for cables and adapters, and the lumbar support makes carrying the bag more comfortable and less strenuous. The Contour Terrain Notebook Backpack ($49.99) has a large main compartment and organizer side compartments made of a lightweight, water- and stain-resistant material. The Contour Cargo Notebook Case ($69.99) has a quick-access compartment with storage pockets tailored for devices such as cell phones or digital music players and DropShield protection for your laptop computer. Finally, the Contour Balance Notebook Case ($69.99) is made of lightweight, water-resistant microfiber material. It includes hidden pockets for a sleeker look and a luggage strap that connects easily to other bags.

The new computer mice offer a variety of features in a range of prices. Si Series offerings include the Si750m Wireless Notebook Laser Mouse ($49.99), one of the smallest available, with a mini receiver that discretely slips underneath the mouse for storage and long battery life with a single AA battery. The Si650m Wireless Notebook Optical Mouse ($39.99) is slightly larger and adds a four-way tilting scroll wheel for convenient Web browsing and document navigation.

Kensington's Ci series, which targets the bargain-savvy, has two budget-priced offerings, such as the Ci65m Wireless Notebook Optical Mouse ($29.99). Comfortable for left- and right-handed use, the mouse has three buttons, a scroll wheel, and a receiver that snaps onto the bottom of the mouse for travel. The Ci25m Notebook Optical Mouse ($19.99) has a retractable cord for convenience and features DiamondEye technology, which anticipates the cursor's path and varies speed. All of these products are available from the Kensington's online store and selected retailers nationwide. ▲

New Battery Technology Leads To Possible Lithium-Ion Successor



Silver-zinc battery technology promises longer life in a safer, more environmentally friendly package.

Zinc Matrix Power (www.zmp.com) unveiled its new silver-zinc battery pack technology at the Intel Developers Forum, at which they also received Intel's Technology Innovation Accelerated award. Although specific details were not available at press time, the company promises that its new silver-zinc batteries will be available to hardware manufacturers in early 2007 for review, with actual products on the market soon afterwards. Another plus is that the new batteries are designed to be easy to recycle, because they don't contain any lithium or flammable components. In light of the recent wave of laptop battery recalls, the news that the silver-zinc batteries are both safer and should last twice as long as their Lithium-Ion cousins should be quite welcome. ▲

Updated iPod nano Inspires New Accessory Designs

The new Apple iPod nano, with its aluminum body and bold new color choices, has inspired third-party accessory makers to create new cases to protect the portable music player. Proporta (www.proporta.com) has unveiled its new Alu-Crystal case ($35.95), which takes a unique approach. The back of the case is made of aluminum for durability and the front of the case is shatterproof plastic, which protects the entire front of the new nano while also allowing the colorful device to show off its paint job. The double hinge lets you fold the front of the case around to the back if desired, and cutouts provide access to the headphone jack and charge/sync port. A secure closure latch prevents the case from opening accidentally.

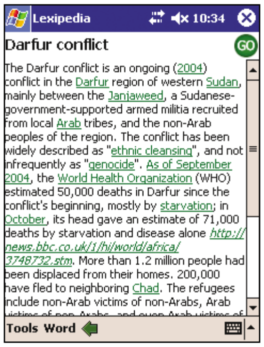
Belkin has also released several cases for the new nano, including the Canvas Holster Case ($19.99), the Slider Case with arm band ($29.99), and the Flip Top Hard Case ($14.99). The KickStand II ($29.99) integrates a display stand for easy hands-free viewing of videos and comes with a removable belt clip; the Neoprene Holster ($19.99) adds a splash of color with your choice of fuschia/gray and orange/black color combinations. Finally, Belkin announced the TuneCast 3 ($49.99), an update of its previous FM transmitter accessory, which now includes integrated cable management and a new status indicator on the LED screen. ▲

Put Wikipedia On Your Handheld With Lexipedia & Quickipedia

Two new software offerings bring the power of Wikipedia, the free online encyclopedia, to your handheld device. Lexipedia (revolution.cx/Lexipedia/Lexipedia.htm) was developed for the Windows Mobile platform and is available for both standard devices ($14.99) and Windows Mobile smartphones ($19.99). It contains 550,000 articles (approximately one-third of the online version) that are clipped and compressed for fast access, and three different databases are available.

The smallest version is just over 300MB and contains articles of 2,000 characters or less, and the mid-size version, which requires 444MB storage space, has articles of 4,400 characters or less. The unabridged version requires 712MB space. Additional features include keyword searches and a "sounds like" search that helps users find the right articles even if they don't know how to spell the search topic. You can get a free demo if you want to thumb through Lexipedia before committing to a purchase.

Quickipedia for Palm OS devices takes a slightly different approach. Rather than condense articles into an offline database like Lexipedia, Quickipedia is a handheld client designed to provide fast access to the full online version of Wikipedia. Features include fast searches with full hyperlinks, an archive of recently viewed articles, and a random article feature. Quickipedia is $14.95 at www.standalone.com/palmos/quickipedia and requires an Internet-connected handheld, such as a Palm OS Treo. ▲



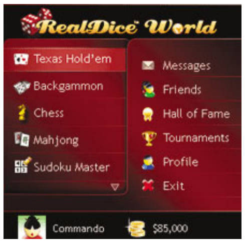
Darfur conflict

The Darfur conflict is an ongoing (2004) conflict in the Darfur region of western Sudan, mainly between the Janjaweed, a Sudanese-government-supported armed militia recruited from local Arab tribes, and the non-Arab peoples of the region. The conflict has been widely described as "ethnic cleansing", and not infrequently as "genocide". As of September 2004, the World Health Organization (WHO) estimated 50,000 deaths in Darfur since the conflict's beginning, mostly by starvation; in October, its head gave an estimate of 71,000 deaths by starvation and disease alone *http://news.bbc.co.uk/1/hi/world/africa/3748732.stm*. More than 1.2 million people had been displaced from their homes. 200,000 have fled to neighboring Chad. The refugees include non-Arab victims of non-Arabs, Arab

Lexipedia can put all the knowledge of Wikipedia in the palm of your hand.

RealDice Pioneers Cross-Platform Gaming For Handhelds

RealDice, Handango's 2006 Palm OS Developer of the Year Champions Award winner, has just announced the arrival of RealDiceWorld. The subscription service gives handheld users a virtual community Xbox 360 and PC gamers have been enjoying, providing the infrastructure necessary for Palm OS, Windows Mobile Pocket PC, smartphone, and BlackBerry users to play multiplayer games together, regardless of the platform each individual is using. Java-equipped mobile phones will also be able to join RealDiceWorld in the near future, and some RealDice games are already available for play on that platform.



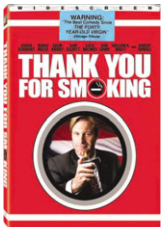
Each player can create a custom avatar and user profile, win virtual medals based on performance, and also unlock new gaming options. In-game chat will be available, as well as community messaging, and players can create buddy lists to see when friends are online and check the Hall of Fame for high scores. Members also have the opportunity to enter weekly tournaments for substantial rewards that include Amazon gift certificates, Apple iPods, and other prizes. Games currently available include Texas Hold'em, Backgammon, Chess, Mahjong, and Sudoku Master, with a new game promised each month. The monthly subscription cost is $7.95, which provides access to all community features and unlimited games. ▲

At Your Leisure

The entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest and most interesting releases in PC entertainment, consoles, DVDs, CDs, and just leisure and lifestyle stuff we (for the most part) love and recommend, read on.

Audio Video Corner

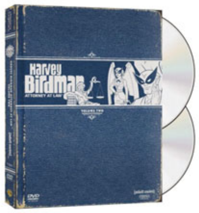
DVDs by Chris Trumble, CDs by Blaine A. Flamig



$19.95
Fox Home Entertainment
thankyouforsmokingdvd.com

Thank You For Smoking

At first glance, "Thank You For Smoking" appears to be a comedy with a strong anti-smoking message; indeed, the tobacco industry isn't portrayed in the best light in this movie, but in truth the film is about much more. The movie also gives the lobbying industry a poke in the chops and takes a swipe at politicians who seem to be as willing to use creative PR and spin (and, possibly, less savory methods) to advance their agendas as the big companies. But ultimately "Smoking" is about the moral flexibility that allows people to do whatever it takes to "pay the mortgage." Aaron Eckhart shines as Nick Naylor, dashing tobacco lobbyist, and gets plenty of help from Katie Holmes, Sam Elliot, and Robert Duvall. Yes, some of the gags are a little overly simplistic, but this is a pretty funny movie.



$29.99
Turner Home Entertainment
www.adultswim.com

Harvey Birdman Attorney At Law, Vol. 2

One thing those of us from a couple generations nearly all have in common is that we grew up with Hanna-Barbera cartoons. And what better way to celebrate those golden years than with a show that plunks all those lovable characters into embarrassing legal situations so they can be (shoddily) defended by Harvey Birdman, Attorney At Law? Thanks to the sterling voice talent of Gary Cole (Birdman), Stephen Colbert, Michael McKean, and others, as well as the efforts of a writing team that just has way too much fun, "Birdman" is another of our perennial Adult Swim faves. The Vol. 2 DVD set includes 13 episodes on two discs and scads of the bizarre extras you've come to expect from Adult Swim DVDs.

$18.98
Warner Bros. Records
www.robertrandolph.net

Robert Randolph & His Family Band—"Colorblind"

Now three records deep into what will likely be a very long, productive career, 13-steel string pedal guitar player Robert Randolph and his four-man band continue to amaze on "Colorblind," a considerable departure from 2003's breakout album, "Unclassified." Known for his killer live shows, Randolph relies less on the blues here in favor of funk. There are still touches of Randolph's gospel upbringing in House of God Church in Orange, N.J., but these songs sound more like rocked-out Parliament Funkadelic, Sly & The Family Stone, and Curtis Mayfield. Throw in appearances from Dave Matthews and Eric Clapton, and this is one terrific album.

$18.98
Artists First
www.jerryleelewis.com

Jerry Lee Lewis—"Last Man Standing"

He's the Killer, he's Jimmy Swaggart's cousin, and he's arguably the true king of rock and roll (all due respect to Elvis, Chuck, and Little Richard). Whatever you call him, Jerry Lee Lewis is still ferocious and as sinister a boogie woogie piano player as there ever was. This unexpectedly excellent set of 21 duets features contributions from some serious rock heavyweights. The album has been around awhile, but if you missed it the first time around, don't now. Only Jerry Lee can turn guys like Jimmy Page, B.B. King, Bruce Springsteen, Neil Young, Keith Richards, Merle Haggard, Eric Clapton, and others into background players.

See the full reviews from A/V Corner at www.cpumag.com/cpudec06/AYL

DVD Byte

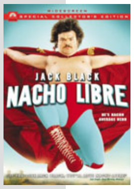
DVD Byte

October 24

Nacho Libre

Slither

Greg the Bunny: Best of the Film Parodies

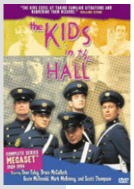


October 31

Mission Impossible III

The Kids in the Hall Megaset

Nobody Wants Your Film



November 7

James Bond Ultimate Collection, Vols. 1 & 2

Transformers The Movie: 20th Anniversary Special Edition

Beavis & Butt-Head: The Mike Judge Collection

November 14

The Da Vinci Code

Family Guy: Volume Four

Who Killed The Electric Car?

CPU
Game Of The Month

Microsoft Flight Simulator X

The Great Blue Beyond *-by Dr. Malaprop*

$49.99 (PC; $69.99 Deluxe Edition) • ESRB: (E)veryone • Microsoft • www.flightsimulatorx.com

It's been approximately 26 years since the debut of subLOGIC's Flight Simulator on the Apple II, but it wasn't until Flight Simulator II in 1983 that I took my first flight (in fact, an original copy of the game still resides on my shelf). Fast-forward 11 iterations (Microsoft licensed and release Flight Simulator 1.0 in 1982) to Flight Simulator 2004, which we reviewed in the November 2003 issue (page 88): At the time, we were impressed by the game. FS 2004 was the best PC-based commercial flight simulator available. That changes with Flight Simulator X, which effortlessly wrestles that mantle from its predecessor.

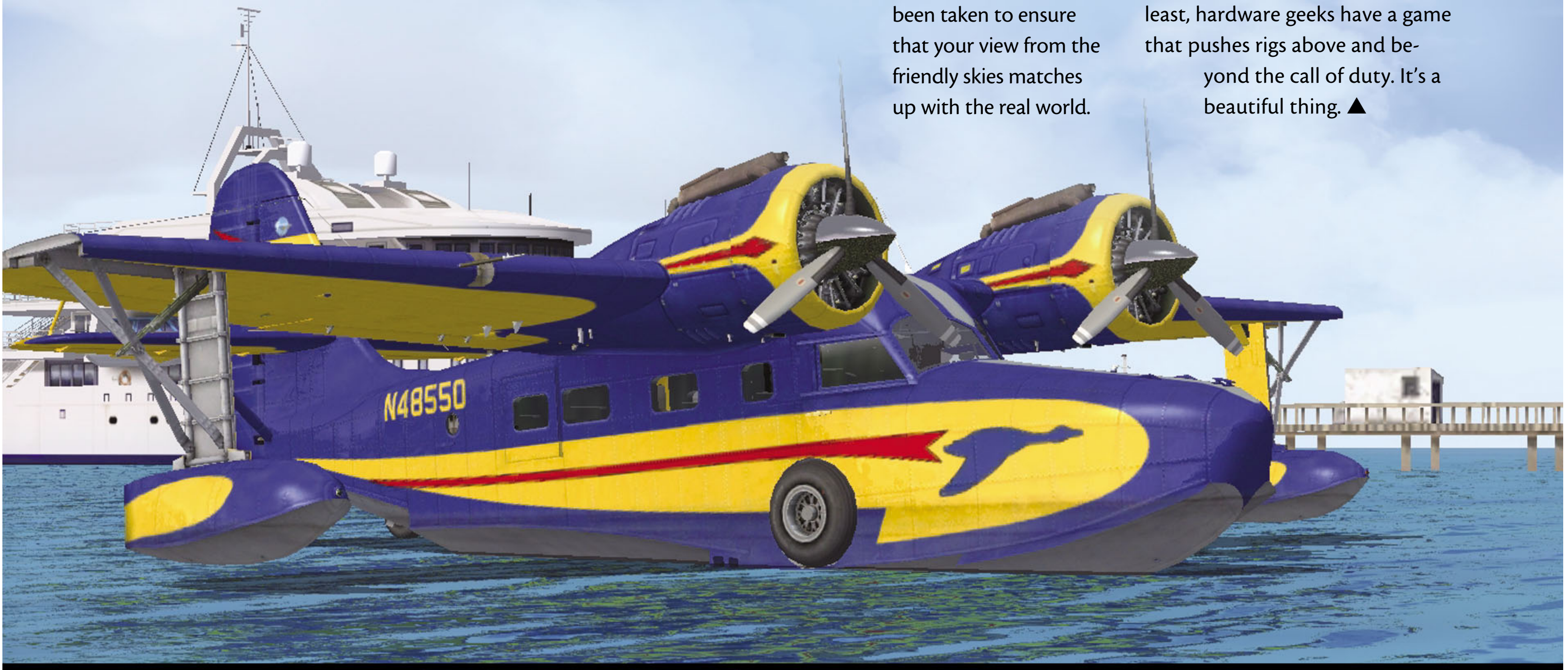
The game is available in either the Standard or Deluxe Edition; both ship on two DVDs. You can see the detailed differences between the two on the official Web site, but additions to the Deluxe Edition (reviewed) include six more planes, five extra-high-detail airports, 10 additional high-detail cities, more than 20 extra structured missions, the glass-panel Garmin G1000 cockpit on a few airplanes, and player air traffic control.

FSX is Microsoft's attempt to make its complex commercial flight simulator accessible to novice wannabe armchair pilots *without* compromising the expectations of experienced flight jockeys. It would seem that Microsoft has succeeded. All of the free-form flight options continue to be available, but the new missions make the game more enjoyable for less serious fans. You whisk through flight basics (tutorials) to some complex maneuvers/objectives. The mission structures make FSX more than just an amazing aeronautical sandbox.

Crank FSX's slides to the max and it will turn into a gorgeous slide show fit for an SLI/CrossFire rig with a high-end CPU. Microsoft has promised DirectX 10 support for FSX in Windows Vista, and some of the artist renditions for expectations on how the game will look when running under the new OS are painfully good. That's speculative, of course, and we'll reserve our shock and awe for when we see the game running under DirectX 10 first-hand. That said, FSX is no slouch under DX9 when you max out the widescreen eye-candy settings. Great pains have been taken to ensure that your view from the friendly skies matches up with the real world.

High-detail cities and airports (with more to come from third-party developers) visually replicate most any flight-related experience you could have in flesh and blood. Furthermore, the Living World feature enhances your being-there feeling by including moving road, sea, air, and field (yes, livestock and wild animals) traffic. And somewhat related is what Microsoft calls Shared Skies. This moniker brings a substantial upgrade to the franchise's multiplayer capabilities. Beyond having real players flying around in a shared airspace, armchair pilots will also be able to take on the role of the ATC (Air Traffic Control) to guide planes in the shared airspace.

Microsoft has brought its flagship PC franchise several steps forward. Long-term fans will not be disappointed, and novice pilots will find the game more accessible than ever. Last but not least, hardware geeks have a game that pushes rigs above and beyond the call of duty. It's a beautiful thing. ▲



DEFCON
EVERYBODY DIES

"Shall . . . We . . . Play . . . A . . . Game?

-by Dr. Malaprop

$17.50 (PC Download; $26.25 CD) • ESRB: (M)ature

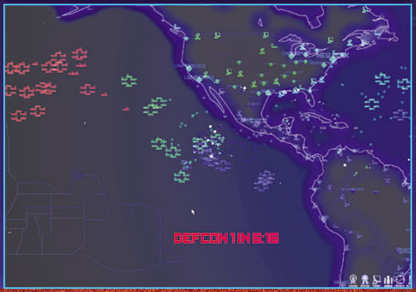
Introversion Software • www.everybody-dies.com

UK-based Introversion Software released the titles Uplink and Darwinia (www.darwinia.co.uk) to much critical acclaim; the latter won top spot at the 2006 Independent Game Festival Awards. Defcon: Everybody Dies is Introversion's third and newest release. It will warm the hearts of anyone old enough to remember 1983's "WarGames," which featured a young Matthew Broderick bringing the world to the brink of global thermonuclear war. (Kiddies, head over to IMDB or en.wikipedia.org/wiki/War Games for the Cliff's Notes.)

Let's review the Defcon recipe: Take a simplistic military-looking world map from the Cold War era, divide it by six superpower regions (the U.S.S.R., Asia, North America, South America, Europe, and Africa), add simple but highly stylized graphics, mix in haunting ambient audio, and toss it all with strategic global launch nuclear attacks sans resource management. That's Defcon in a nutshell, which in play ends up being much more than the sum of its parts. And as the superpowers destroy each other with casualties in the tens of millions, you learn that winning is losing the least. But here's where Defcon really gets you: It's a blast, so to speak.

Gameplay is simple but so compelling. The phosphorous maps and animation graphics, simple icons, and dotted-line nuke launch trackers help you buy into it. Defcon lacks a single-player campaign after the tutorial, but you can play against the computer. The game really shines when played against up to six opponents in multiplayer.

Don't mistakenly associate the budget pricing with a budget game; this indie gem is on par with or better than many top-tier titles costing twice as much. Hello mass destruction, goodbye productivity. ▲



JUST CAUSE

Viva La Revolution *-by Chris Trumble*

$49.99 (X360), $39.99 (PC) • ESRB: (M)ature • Eidos Interactive • www.eidosinteractive.co.uk/gss/justcause

Sandbox gameplay isn't as fresh and new as it used to be back in the days following the initial launch of Grand Theft Auto III, but it's still a highly enticing proposition. Eidos' recent release, Just Cause, takes the open-ended, living world gameplay concept (including the freedom to take and drive/ride/pilot nearly 90 vehicles, and so on) and sets it against the backdrop of an island nation ruled by a military dictator with dreams of owning his own nuclear weapons. You play the role of Rico Rodriguez, a government agent charged with the task of helping San Esperito throw off the traces of its corrupt government in favor of one less inclined to purchase weapons-grade uranium.

In the course of doing so, you'll take on a series of covert missions that will require you to put Rico's life on the line in all sorts of interesting ways. You'll skydive and parasail your way around the island, often with the intent of landing on rapidly moving vehicles. You'll take on President Mendoza's corrupt troops singlehandedly, and you'll carjack and blast your way to San Esperito's freedom. Every good game has something that sets it apart from others in its genre, and, in the case of Just Cause, it's Rico's insanely acrobatic antics. You'll need to suspend your disbelief a bit as Rico jumps from moving car to moving car in order to fully appreciate this game, but the fun you'll have is well worth the effort.

The game shipped across several platforms, but we looked at the PC and Xbox 360 versions. Upon spending any time in the game, it quickly becomes apparent that the blocky graphics and rough animation that used to characterize sandbox games has given way to lush, rich visuals rivaling the best FPS titles. Just Cause looks great, plays well, and is quite simply a blast to play. ▲

Poetry In Motion *-by Chris Trumble*

$39.99 (PS2) • ESRB: (T)een • Capcom • ww2.capcom.com/okami

It's often popular among video game circles to complain about the way big publishers milk all the revenue they can from a popular game franchise, and Capcom has certainly had its fair share of criticism in that vein. But any fair discussion of Capcom's place in the gaming market has to acknowledge the company's occasional flashes of innovative brilliance. After all, none of those long-time franchises would be possible if the original games hadn't been good to begin with, and there's no denying that Capcom takes risks to step outside the norm, often with refreshing results (see Killer 7, Viewtiful Joe, Dead Rising, et al.).

Okami is Capcom's most recent foray into the undiscovered country of nontraditional gaming, and we think it's an unqualified success. The game's unique visual style is the first thing that will grab your attention; Okami is hauntingly beautiful. But the dev team at Clover didn't stop there; it gave the game an interesting play style to match its looks.

If anything about Okami is less than cutting-edge, it's the story of a world corrupted by evil that you must restore to peace and order. But the way you get there and what you'll see along the way are unlike anything you've experienced; Okami is part action game, part god game, and all fun. ▲

Paranoia On The Open Seas

-by Dr. Malaprop

$19.95 (PC) • ESRB: N/A • Outerlight • www.theshiponline.com

Once upon a time, there was a free Half-Life mod that morphed into a $20 standalone Source engine-based game. Developer Outerlight decided to mix genres and combined elements of an FPS (movement), The Sims (needs), and Clue (mystery and murder) to create an innovative game equally playable by casual and hardcore gamers.

The game's premise has you as one of the characters on a luxury cruise liner gone awry. Every character on the ship is assigned to kill one other character, which means that someone else on the ship will be stalking you as you embark on your own murderous quest. Though conceptually simple, this gameplay mechanic introduces a great deal of tension as you wander through the ocean liner's many rooms, lounges, and narrow hallways.

The art deco graphic style employed in the game bears no resemblance to Half-Life 2 even though The Ship shares the Source engine. The stylized 1920's-era characters bring panache to the game's overall look, and you may find yourself feeling like you're actually *in* (as in not playing) a twisted game of Clue. The Ship is easily ruined by griefers and the key gameplay element is a bit of a one-trick pony that may not have long-lasting value, but there's plenty of fun to be had before the key concepts grow old. ▲

A Company Of Other Heroes

-by Dr. Malaprop

$29.99 (PC) • ESRB: (M)ature • THQ • www.dow-darkcrusade.com

Relic Entertainment, the developer behind 1999's groundbreaking Homeworld and this year's Company Of Heroes (reviewed in our Nov. 2006 issue), introduced its first sci-fi themed Warhammer 40,000 title—Dawn Of War—in 2004. We heaped praise on DoW and even more on its Winter Assault expansion.

Dark Crusade is the second RTS expansion pack to Dawn Of War. We took it for an extended spin and were pleased to find two new races (the robotic Necrons and multi-specied Tau) with the ability to play the five other races found in Relic's previous Warhammer offerings. The challenging single-player campaign is sure to keep fans well entertained. One key highlight is the nonlinear board game-style decisions gamers can make, so instead of a scripted experience, gameplay dynamically mirrors your strategic decisions.

Relic and THQ's generous, customer-focused stance is something we'd love to see more of: Dark Crusade is a standalone expansion that doesn't require the original game or previous expansion. You don't need the CD in the drive to play, and you can install the game on multiple PCs for LAN play. The game feels worthy of the $30 pricing, but to gamers new to the series we recommend the Dawn of War Gold Edition ($29.99); Dark Crusade may just be too much to bite off for a first-round encounter with our favorite Warhammer RTS franchise. ▲

An Epic Trilogy Comes To A Close *-by Chris Trumble*

$39.99 (PS2) • ESRB: (T)een • Namco Bandai Games • xenosaga3.namco.com

We gave the first two titles in Monolith and Namco's Xenosaga RPG series high marks (after all, what goes together better than mech combat and Nietzsche?), and fans will be happy to know the third game is an apt end to the trilogy. The game ties up the loose ends that remain following the end of XenoII (some of them less than neatly), in the process serving up the same engaging blend of cinematic story and turn-based combat.

If you're unfamiliar with the Xenosaga series, note that this is decidedly not the place to jump on; you should look for copies of the first two games and play through them so you can get up to speed, or the events in XenoIII will make no sense to you.

We won't give up the goods story-wise, but as you can guess if you played the prequels, it involves lots of enormous space battles, bajillions of Gnosis, large A.G.W.S. mechs, sentient robots (that's right, "robots," as in plural), and more than a little megalomaniacal posturing. We loved it. ▲

Xbox Live Vision Camera

Video Chat Comes To The 360

Microsoft's answer to the Sony EyeToy camera (originally for the PlayStation 2) is a basic way to videoconference on the Xbox 360. The rumor mill on an upcoming Xbox 360 camera started churning soon after the console's launch in the 2005 holiday season. This poorly kept secret was shown off at E3 2006 and recently hit retail just in time for the holiday buying season.

At press time, there were a limited number of applications designed to take advantage of the Xbox Live Vision, but this will likely improve as the console is upgraded. If you're already occupying the rear USB port with a wireless network adapter, you'll need to plug the Live Vision into one of the USB ports located in the front of the console.

The Web cam works seamlessly with your 360. Set the camera in front of you, turn on your 360, adjust the camera's focus ring, and you're good to go. The camera supports stills at 1.3 megapixels and runs 640 x 480 images at 30fps. The Xbox 360 software lets you adjust the image quality according to your room's light settings.

Beyond adding a static GamerTag image viewable by your friend's lists (your non-photo icon will be viewable by those *not* on your friend's list), you can also use the Live Vision in games such as TotemBall (www.xbox.com/en-US/games/t/totemballxboxlivearcade), Uno (www.xbox.com/en-US/games/u/unolivearcadexbox360), Bankshot Billiards, and the Xbox Live Arcade parlor games. These games alone don't make the Live Vision a must-buy, but the coming potential for face mapping (Rainbow Six Vegas) and in-game gesture control definitely make it interesting. Until then, the camera's use is limited and scoring is based on its use today. The Live Vision doubles as a basic Web cam for your Windows XP/Vista PC. ▲

$39.99 (Xbox 360 & PC;
$79.99 Xbox Live Vision Gold Pack)

Microsoft

www.xbox.com/en-US/hardware/accessories

CPU Rating: ●●●

Review hardware supplied courtesy of Dynamism.com (www.dynamism.com/gp2x)

GamePark GP2X-F100

Handheld Gaming For Power Users

$179.90 to $199.99

GamePark Holdings

www.gp2x.com

CPU Rating: ●●●◐

The GamePark GP2X is for the power user that scoffs at the locked-in nature of the Nintendo DS Lite and Sony PSP. This Linux-based handheld is powered by dual 200MHz CPUs, 64MB SRAM, and custom graphics/decoding processors. The sizeable 320 x 240 TFT backlit screen is decent, and the SD card slot delivers data storage flexibility. You can even output Xvid/DivX video from the GP2X to a TV with an optional cable video-out cable. Juice comes courtesy of two AA batteries or an optional power adapter.

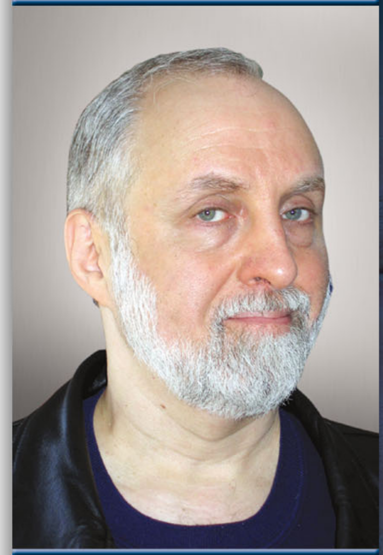
Gp32x.com is a massive online resource that should not be missed. Spend some time reading through the site and you'll learn how to run emulators for MAME, Atari 2600/7200/5200/Lynx, and Sega Genesis to name a few. You'll also get insight into developing your own custom code. We played Ultima VII (using the Exult emulator), classic LucasArts adventure games (using ScummVM), as well as several classic arcade titles (MAME). All worked impressively.

Our biggest beef with the GP2X was the poor ergonomic design, seemingly poor build quality (the thumbstick hat that came off didn't inspire confidence), and battery life. Our initial fear of having bad hardware was unfounded once we discovered that the screen suffered from heavy flickering after using AAs for a few minutes. Include the cost of rechargeable Lithium-ion batteries if the GP2X will be on the move.

This little device looks better than it feels but permits the unrestricted use of emulators, games, music, videos, and photos. The GP2X is a powerful, flexible handheld that welcomes hackers and lets you enjoy your media *your* own way. ▲

The Cutting Edge

by Barry Brenesal



N-KB3

A few weeks ago, I was sitting in the Budapest Opera before a production of Bartók's "Bluebeard's Castle." I recalled the last opera I'd watched, a DVD production of Handel's "Giulio Cesare." This particular version moved the work from Egypt in the time of ancient Rome to the late 19th century and employed many bold visual metaphors that were fun to watch. For example, one of Caesar's arias, a stately march about intrigue and diplomacy, was displayed as a choreographed dance on a chessboard-like floor between Caesar and his opponents. This, as you might guess, got me thinking about Hungarian chess masters, such as Richard Réti, and by way of that, a chess game I'd once lost to a computerized version of Réti which was nearly as poetic as the real man's games.

Computerized chess has come a long way since Dr. Dietrich Prinz (whose teachers at Berlin University included Albert Einstein and Max Planck) wrote the first chess playing program for the Manchester Ferranti computer. It debuted in November 1951 and took 15 minutes to solve problems involving a mate in two moves. A whole game? Not likely. That had to wait for 1957, when Alex Bernstein, an IBM programmer and chess player, devised a chess program for the IBM 704. It was easily beaten by novice players and took eight minutes to search four moves ahead, but the point was that it worked.

It was about that time the American polymath and futurist, Herbert Simon, declared a computer would be the world's chess champion within 10 years. He was more than slightly off in his prediction. It would be 40 more years before a computer managed to defeat a reigning world chess champion in a match, a testament less to extraordinary coding and modern processing ability than to the astonishing power of the human brain that continues to challenge the finest specialized computers.

Meanwhile, it wasn't until 1962 that the first chess program capable of beating even rank amateurs surfaced at MIT. And it wasn't until 1966 that a chess program entered a nationally recognized chess tournament. Richard Greenblatt's MacHack VI scored one draw and four losses at the Massachusetts Amateur championship. By the end of the following year, it had won and drawn three games apiece, and lost 12. The United States Chess Federation declared it an honorary member.

A different developmental approach focused on computer processing speed, rather than better search algorithms and heuristic patterning strategies. In 1977 Ken Thompson and Joe Condon built Belle, utilizing custom-designed circuitry that ultimately increased its speed from a standard 200 positions per second to 160,000 positions per second, or eight moves ahead within a reasonable length of time. It cost $20,000 to make, and in the 1982 North American Computer Chess Championships, it beat Robert Hyatt's Cray Blitz program running on a multimillion-dollar Cray supercomputer.

In that same year, Belle was confiscated by the U.S. State Department on its way to participate in a Soviet computer chess tournament. Transferring high-end technology to an enemy, you know. Very evil.

However, capitalism was making computerized chess available over the retail counter to anyone with a few dollars. These programs proved very popular. The rights to Peter Jennings' Microchess were purchased by Personal Software, and its success helped fund the first superstar of computerized spreadsheets, VisiCalc. My own first experience with a computerized chess game came in 1982, when I purchased the new Sargon II, by Hayden Software. As I recall, it loaded on my Radio Shack computer through a cassette, a wonderful feature that left me with plenty of time to catch up on rereading Levi-Strauss' "The Structural Study of Myth." But let's not patronize Sargon or early PC-based chess programs. In 1989, Sargon IV won against a program called Awit on a $6 million mainframe, and Sargon V achieved the international rating of a recognized chess master.

Chess programs had come of age. On the PC they continued to improve, but also moved into such areas of importance as tracking matches, chess tutorials, spoken analysis of played games, and multiple opponents playing in styles based on an analysis of recognized past grandmasters. Your average modern chess program may not beat the likes of Garry Kasparov, but it will more than hold at bay mere part-time pawn pushers like you and me. ▲

Holiday Wish List

1. A RAM implant—for myself.

2. A DVD of Astérix & Obélix: Mission Cléopâtre in English, NTSC mode.

3. 1/100th of 1% of Bill Gates' personal fortune. In small, unmarked bills.

4. An RPG made for someone with more brains, maturity, and socially interactive skills than a shuttered 10-year-old.

5. A futurist who acknowledges that the Internet isn't going to bring pizza and new shoes to starving, poverty-stricken African villagers. Ever.

6. A Georgian manor house in Kent with all upkeep paid in perpetuity.

7. That would be in addition to a split level Art Noveau townhouse in Maastricht.

8. The modernized Frank Lloyd Wright-redesigned farmhouse in Oregon is optional.

Transferring high-end technology to an enemy, you know. Very evil.

Wax nostalgic with Barry at barry@cpumag.com

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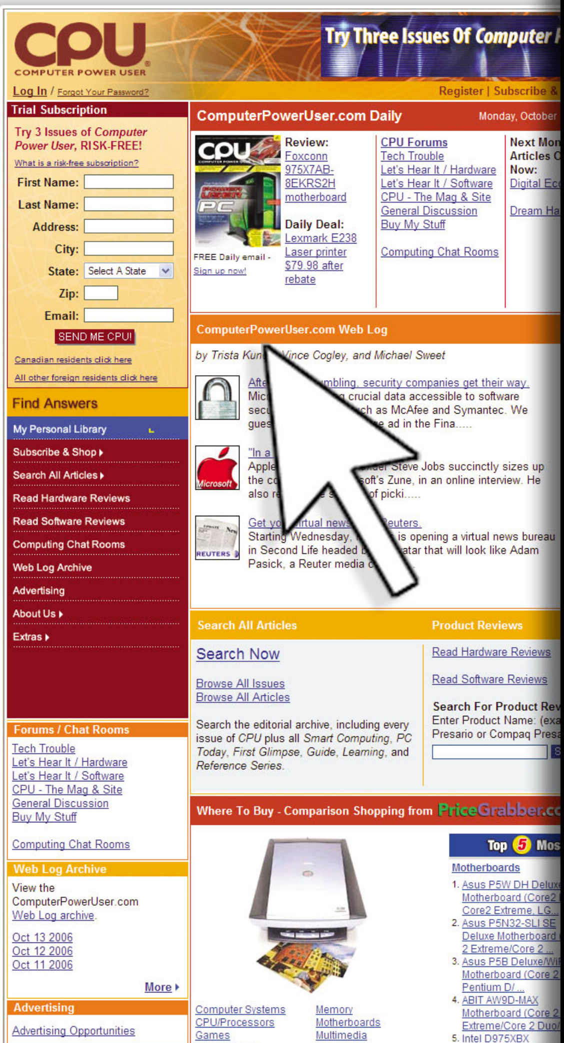

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Software Tips & Projects

Viva Vista

By the time you read this, there may be a solid release date for Microsoft's Windows Vista OS, but curious *CPU* readers may want to experiment with one of the latest prerelease versions. No doubt we'll feature Vista tips in this column throughout 2007 as all of us get up to speed with the new OS; and so, here's the first set of many Vista tips, fixes, workarounds, and Registry hacks to come.

Until users have experience with upgrading to a final release version of Vista from Windows XP, we strongly urge installing the new OS on its own partition on your hard drive. At least in the prerelease version, there's no easy way to uninstall Vista if it has written over and upgraded your current WinXP installation, so it's best to keep both versions running at once for now.

(*NOTE: We used the August 2006 RC1 [Build 5600] for these tips. Some features and naming conventions continue to evolve in these final beta releases, so the version you use may carry different labeling for similar functions.*)

Flip In 3D

If you have the hardware to run Windows Aero, then you can play with some cool effects. To begin, click Start, Control Panel, and Appearance And Personalization. Next, click Personalization and then Windows Color And Appearance. Then, click the Open Classic Appearance Properties For More Color Options link to open the Appearance Settings windows. Finally, highlight Windows Aero and click OK.

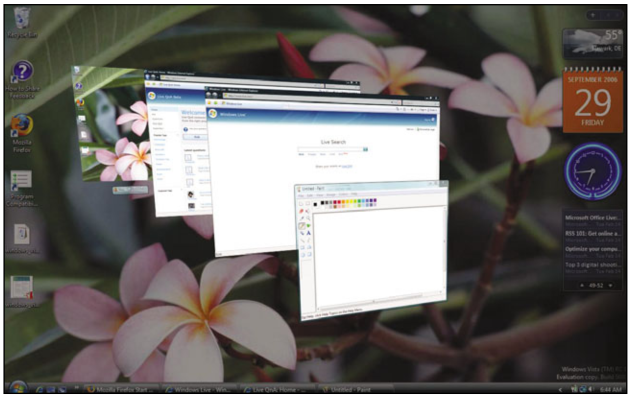
With the cool Flip 3D view in Vista, you can cycle through several open windows at once by pressing Windows key-TAB. Release the Windows key when the window you want is at the front of the stack.

To activate Flip 3D without using the Windows key, right-click the Desktop and select New and Shortcut. In the Type The Location Of The Item field, type **RunDll32 DwmApi #105**. Click Next to give the shortcut a name and then click Finish. When you double-click the Desktop shortcut, Flip 3D lets you rifle through the available windows. We found it convenient to drag this new shortcut into the Quick Launch area of the Taskbar. From the Quick Launch bar, you can launch the Flip 3D shortcut with a single click, and open windows won't ever hide it.

Just Like The Old Days

If you find the new Explorer or Internet Explorer windows too sparse and wish for the old menu toolbar, just press ALT and the old-style menu toolbar will pop up.

Also, you'll notice that the Run command is missing from the Start menu in Vista, but don't panic, Microsoft isn't locking out hard-core tweakers like us. To get the Run



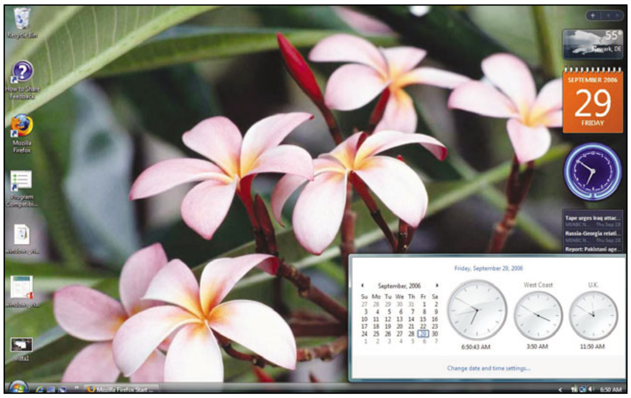
Launch the new Flip 3D task switcher by pressing Windows key-TAB.

WinXP Tip Of The Month

The first step in getting ready for Windows Vista is determining whether your current hardware can handle the new OS and then which of several versions is right for you and your PC. Get a head start by going to www.microsoft.com/windowsvista/getready/upgradeadvisor/default.mspx and downloading the Windows Vista Upgrade Advisor RC. Once you install and launch it, tell the program to scan your system. When the scan is complete, it will recommend a version of Vista. Scroll down to the System Requirements section and drill into any of the See Details buttons to get specific advice and warnings about the changes you'll need to make to your system before and after installing Vista.

Registry Tweak Of The Month

Tired of downloading and playing media files in Windows Media Player and getting sneaky Web pages that pop up? Some video files contain HTML code that activates when you try to start the video. To disable this hole, click Start, Run, type **regedit** in the Open field, and click OK. Next, go to HKEY_CURRENT_USER\SOFTWARE\MICROSOFT\MEDIAPLAYER\PREFERENCES. Right-click Preferences and select New and DWORD Value. Name the new value PlayerScriptCommandsEnabled. Double-click the Value, type **0** in the Value Data field, and click OK to disable HTML scripting.

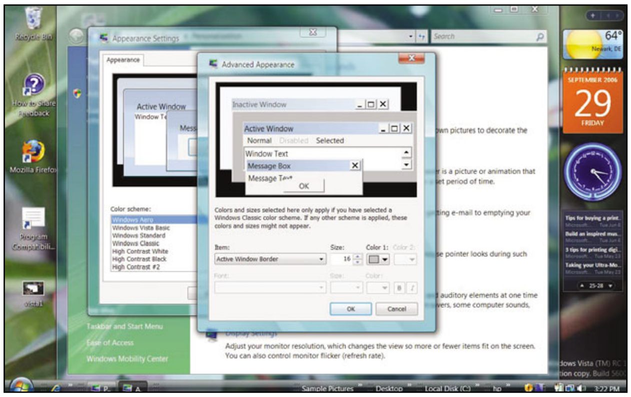


Vista lets you add two additional clocks to the System Tray to track three time zones.

command back, right-click the Start button and select Properties. In the Start Menu tab, click the Start Menu radio button and then click Customize. Scroll down the list to find Run Command, check the box, and click OK. If you don't want Run cluttering the Start menu, however, you can always bring it up whenever you want by pressing Windows key-R.

Get Up To Speed

With Vista you can track two additional time zones from the System Tray. Click the digital clock in the lower-right corner of the screen to open the calendar and analog clock. Click the Change Date And Time Settings link and then click the Additional Clocks tab. Check one or both additional clocks, set the time for each, and click OK. (You also can enter your own display name for each.) When you move your mouse pointer over the time in the System Tray it will now show two or three clocks.



Colors and sizes selected here only apply if you have selected a Windows Classic color scheme. If any other scheme is applied, these colors and sizes might not appear.

Item: Active Window Border

Size: 16

Display Settings

Adjust your monitor resolution, which changes the view so more or fewer items fit on the screen. You can also control monitor flicker (refresh rate).

If you really like the new Aero Glass interface in Vista Ultimate, you can enhance the effect by widening the window borders.

Vista has fewer annoying alerts and pop-up balloons than WinXP, but the Security Center still can bug you with constant messages. To reduce this, double-click the Security Center Alerts icon to bring up the Windows Security Center and click the Change The Way Security Center Alerts Me link. Here you can choose whether to leave the alert system as is, eliminate the notifications, or just remove the Security icon altogether from the Taskbar.

While you're in the Security Center, click the Windows Defender link. In the new window, click History to see what Windows is allowing to run on your system. Highlight any of the entries and the window below will locate the resources involved, including its associated Registry key and the location of the relevant file. This lets you manually hunt down any suspected spies.

Out Of CTRL

If you're a fan of pressing CTRL to tag multiple files in a folder for action, Vista has a feature that lets you check boxes instead. Open any folder (or click Computer on the Start menu) and then press the ALT key to bring up the classic menu toolbar. Next, click Tools, Folder Options, and the View tab. Scroll to the bottom of the Advanced Settings window to find and check Use Check Boxes To Select Items and click OK. Now when you move your mouse pointer over a file in Explorer, a checkbox will appear in the upper-left corner that you can use to tag files for any action.

Miscellaneous Tricks & Shortcuts

Vista has a great shortcut for quickly copying the full path name of a file or folder: Press the SHIFT key and right-click the file or folder. Select Copy As Path from the menu to copy the full path name of the highlighted item to the Clipboard.

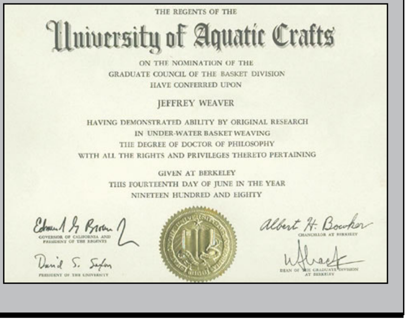
To increase the glass-like Aero look in Vista, widen the transparent borders on your open windows. To do this, right-click the Desktop and click Personalize, Windows Color And Appearance, and the Open Classic Appearance Properties For More Color Options link. Next, in the Appearance Settings window, click the Advanced button. In the Advanced Appearance window, click the Item drop-down menu and select Active Window Border. Increasing the number in the Size field widens the outer edge of your windows, and then every open window will look like it's held within a thick pane of glass. Keep clicking OK in the open windows to apply the change. CPU

by Steve Smith

Infinite Loop

Baskets, Anyone?

For those of you who have always doubted the existence of an underwater basket weaving course, we really hate to disappoint. If you enroll at the University of Plymouth or the University of Central Arkansas, you too can learn how to weave a mean basket under the watery depths. After four years of gratifying basket work, you can receive an Underwater Basket Weaving degree—of course, what benefit this would offer society is still being determined. ▲



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Source: www.neatorama.com/2006/07/08/underwater-basket-weaving-phd

Warm Up To Penguins

Using Cedega To Play Windows Games In Linux

Ask Linux users why they keep a Windows installation around, and the primary reason is often "games." Persuading game publishers to build native Linux versions for everything is going to take time—if the task of demonstrating that a market exists to make the porting worthwhile is even possible. Rather than waiting for such a miracle, companies such as TransGaming Technologies (www.transgaming.com) have stepped into the picture, offering a reimplementation of DirectX under Linux called Cedega.

Checking For Support

Developers for a product such as Cedega cannot anticipate every possible approach. Instead, the company takes each individual game and tests it with the client, honing the software to handle features it hadn't previously encountered. Because of this, before you purchase a subscription to this product and its updates for $5 per month, it's wise to go to the TransGaming Games Database (transgaming.org/gamesdb) and check the playability ratings. These ratings tell you what the typical user's experience is playing the game under Cedega, independent of how much work TransGaming has put into supporting that game. User votes determine ratings exclusively, and given that users can run Cedega under a wide variety of hardware, distributions, and configurations, are a measure of Cedega's ability to handle each game. Clicking through to the game's individual information page will show you more information about how well it functions in Cedega.

Things to look for include its playability rating (TransGaming suggests that games with a rating of three or better are worth trying), the game's rating statistics (click to see which versions of Cedega the game played well under; sometimes a new Cedega release breaks things in a game and sometimes it fixes them), and the Wiki node, which often contains notes on what specifically works and doesn't. It's also a good idea to go to the TransGaming forums (transgaming.org/forum/), where you can look in the sections related to the game in question, your Linux distribution, and your hardware.

Of course, some people prefer to play fast and loose and just buy the software. At the very least, check the playability rating so you don't find yourself shocked that Cedega either can't install the game you wanted to play or can install it but can't actually run it.

Downloading & Installing Cedega

Once you've decided that you want to give Cedega a try, go to TransGaming's site, click the Register For Cedega link, and walk through the subscription process. Once you've logged into the site, read the information for the latest Cedega release and the latest development status and voting report—paid subscribers can vote for which games they think TransGaming should give the most attention. You definitely want to read the release notes, which are also linked from this page. You may find them helpful if you run into problems.

When you're ready to proceed, click the "Get Cedega [version] Now" link. Click through to reach the Downloads page and then click Most Recent Prepackaged Files. This link takes you to the Cedega software license page, which you can read through and then click I Agree at the bottom. Once you have agreed to the license, the Downloads page gives you access to a variety of documentation, such as the latest version's release notes, the Quickstart Guide, and the Troubleshooting Guide.

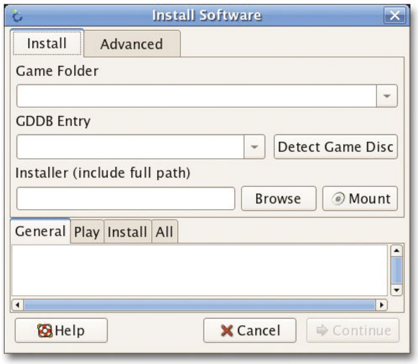
You will also find various versions of Cedega itself, each aimed at particular Linux distributions. (All of their file names start with "cedega-small.") Read the file description for each to determine which version you need to download. For example, Fedora users might download cedega-small-5.2.3-1.i386.rpm. Once you have the package downloaded, install it using your package management system. A TransGaming menu entry may be in your GUI, but if no menu entry appears, the executable is named cedega. In Fedora, it can be found in /usr/bin/cedega.

Configuring Cedega

The first time you launch Cedega, you should complete the Cedega Setup Wizard. This five-step process begins by walking you through authenticating with TransGaming's servers. Make sure you have selected Check For Updates if you only have the interface portion of Cedega installed and still need the engine to run behind it. If necessary, check HTTP proxy and fill in the appropriate information.

Make sure that you are connected to the Internet and then click Forward. You will receive an information dialog box that lists the components you might wish to update. Select everything but the Cedega User Interface Update (you just installed that) and click OK. Cedega will download and install each component you selected after you review and agree to its respective license agreement.

Click OK to proceed to the wizard's Stage 2. Here, the software should display



The Cedega Install Software dialog box acts as the ferryman who ushers Windows games into a Linux world.

information about your system's hardware, your Linux distribution and kernel, and the version of the X Window System you are running. If it doesn't, click Autodetect.

Once you properly fill in the information, click Forward to move to the system tests. By default, all of the system tests should be checked, so click Run Selected Tests to put your computer through its paces. You may not be able to run some games if your system fails a test. And if any of them fail, or if you just want to know what in the heck it's actually testing, click More to learn more. You don't have to have the latest and greatest hardware to pass these tests, but be sure to read the release notes to determine if you meet Cedega's minimum requirements and that the software doesn't have trouble with your particular hardware. For example, at the time of this writing, there are games that will not play when using ATI cards with FireGL drivers.

Get your Bejeweled fix in Linux with the help of Cedega.

Clicking Forward brings you to the Setup Complete section. If there is any text in the Warnings dialog box, be sure to read it. What you find there may be aimed at those who aren't new to Cedega, such as mentions of how configurations might be handled differently than before. Click Finish to close the wizard and launch Cedega.

Installing & Playing Games

Once you have Cedega configured and running, it's time to install your first game. Remember, you aren't limited to those that are officially supported, as long as you keep in mind that there's no knowing whether an unsupported game is guaranteed to work. So, pick something and either make sure it's already installed on your hard drive or pop the game's install disc into your optical drive. Click Install to open the Install Software dialog box (Figure 2).

Enter the name for the folder where the game should be installed in the Game Folder text box. If you're installing a supported game, click Detect Game Disc or choose your game from the GDDB (Game Disk Database) drop-down menu. Those who are installing an unsupported game should select None from the GDDB Entry drop-down menu. For the Installer text box, choose Browse and select the path to your game's installer, whether it's a path to your CD or DVD drive or somewhere on your hard drive. If you discover that Cedega doesn't identify your CD or DVD-ROM, click Mount. Some CD- and DVD-ROMs are set up as both music and data discs, and these confuse some Linux distributions. You may need to mount such items manually with the command **mount -t iso9660 <device> <mount point>** (for example, **mount -t iso9660 /dev/cdrom /media/temp**).

Click Continue when you're ready to install your game. The first sign that things are going well is that the game's own installer windows should appear, prompting you to continue the installation. If your installation doesn't complete successfully, return to the forums and see if you can find hints to make it work. After a successful installation, click the name of the game in the Cedega window's left column and then click Play. Hopefully, the game will launch and play without problems. But if you experience glitches during gameplay (if the game itself even starts), see the forums. Someone may have offered a hint on how to solve your problem.

Although Cedega isn't a one-size-fits-all solution for playing Windows games under Linux, this product is regularly updated and its ease of use improves year after year. If you find that you can't play your favorite game under Cedega, alternatives to try include WINE (www.winehq.org), Win4Lin (www.win4lin.com), Crossover (www.codeweavers.com), and VMWare (www.vmware.com). CPU

by Dee-Ann LeBlanc

Infinite Loop

Now That's An Arcade

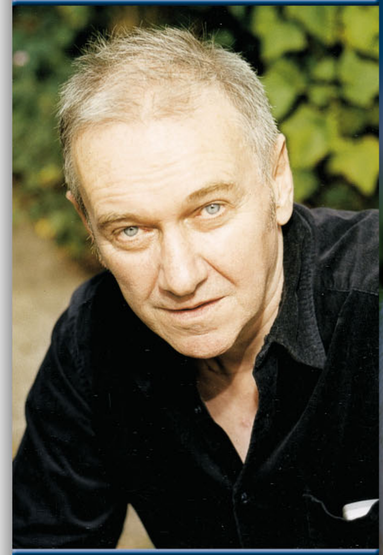
Think the Ms. Pac-Man game you have in your basement is the epitome of old-school coolness? Think again. Jeff Kinder started with a dream—creating an arcade full of nostalgic games—and turned his basement into a collection of classic titles and rope lighting that would put any local roller-skating rink's arcade to shame. The project included "minor" chores such as pouring a new basement, installing a beefed up breaker box, and altering a flight of stairs. ▲

Source: http://www.dragons-lair-project.com/users/jeff/basement/current/

Shavings From The Rumour Mill

by Mike Magee

I Hope My Dream PC Won't Be A Nightmare



Generally, I swap out my desktop PC every couple of years. You might be surprised at the modesty of the machine I use essentially for writing and browsing the Internet, but because I travel a lot, I'm much more interested in features, lightness, and battery life of my notebook. In about June of 2005 I bought a Dell—yeah, a Dell machine—with a 3GHz Pentium 4 with 1GB of memory and a stonking pair of big hard drives, all running under Windows XP. I hung on to my boring old Iiyama 19-inch CRT monitor because I'm still not happy with the resolution of these LCD monitors and also because lifting the huge thing off the desk would probably give me a hernia or worse. Like many other people last year, I bought the Dell on price; it only has a Radeon X300 graphics card inside, but the machine has plenty enough power to write articles and browse the Web.

So here's the quandary: Having seen both AMD and Intel desktop roadmaps clear through to the end of 2007, what kind of machine will I buy to replace my desktop Dell? You notice I say "replace." With Microsoft Vista en route, I've no plans to upgrade the current machine. I used ATI's Vista test; my desktop config will install the new OS, but guess what, ATI recommends I upgrade to a better graphics card so I can run the famous Aero. Having been in this industry for 20-odd years, I've tried every Windows operating system from the very first to the very last, and you know what? Every time there's a major upgrade, my old machine can just about run the new OS, but "just about" is as close as it gets. Funny that, eh? We end users have to keep the cash tills kerchinging, and if you've vast quantities of legacy data from all the numerous versions of Windows and Office, well, you're kind of locked in.

But the CPU in my existing machine is obsolete. According to very recent Intel roadmaps I've seen, it will be at the end of its life in just a month's time. I can't have that. Do I want a Kentsfield four-core Intel CPU in my Vista machine next year? Well, I don't really know, because I'm not absolutely sure what benefits it will give me. We know that scarcely any application software is optimized for dual-core, never mind four-core CPUs.

I'm more worried about whether my current applications will work fine on Vista. I'm sure Microsoft would love me to upgrade to Office 2007, but I'm nervous. I'm still using Office 2000 and balancing on the Microsoft tightrope. Will I have to cross the Vista Niagara Falls with a blindfold on?

So what's ahead? On the Intel front, there will be introductions of the Weybridge Professional and Fundamental platforms, supporting Intel Core 2 Duos and the Bearlake chipset, which comes in many flavours indeed. The Professional set includes 1,333MHz front side buses and 4MB of shared cache, while the Fundamental only has a 1,066MHz bus and 2MB of shared cache. These are chips made using the 65nm process. Then there's the Intel Salt Creek platform, but that's for the Kentsfield Q6600 as well as high-end Core 2 Duos. I'm not certain whether I want, need, or can afford this. What are the benefits? I could wait for the Santa Rosa desktop, which uses the mobile Merom processor but is also confusingly called Core 2 Duo, but in T5000 and T7000 sequences. Merom is a successor to the Banias and Dothan chips; I've had good experiences with this family, as regular readers of this column will know. Or do I wait for AMD to start shipping large quantities of its 65nm chips and see how far and how deep the price war goes before I buy anything in 2007?

Heck, I could even have a Dell with an AMD chip in it now. The choice is beginning to terrify me. Maybe I'll stick with the old-fashioned Dell I've got and see what happens to other people trying to get their heads around Microsoft Vista in its first revision. ▲

Holiday Wish List

1. A guide to cut through the mire of AMD and Intel processor numbers and . . .

2. . . . for Nvidia and ATI to make life easier for people buying graphics cards and trying to make sense of their product names.

3. For Sony and Toshiba to make up and not alienate the whole world in an HD DVD vs. Blu-ray war.

4. That LCD manufacturers would realize we're not going to pay through the nose for expensive monitors with essentially rubbish resolutions.

5. More battery life for notebooks. It's nearly 2007 and all those 2003 promises about fuel cells just haven't come to pass.

Every time there's a major upgrade, my old machine can just about run the new OS, but "just about" is as close as it gets.

Send rumours to "Mad Mike" Magee at mike@cpumag.com.

Wagging The Dog

by Rahul Sood

Voodoo Acquired By HP

As you may already know, in late September HP reached an agreement to acquire VoodooPC. There has been a ton of speculation behind the motives of this acquisition, so rather than regurgitating what people have already written, I prepared a fairly verbose story about the history and the reasoning behind the transaction on my blog; I would encourage anyone interested to check it out.

For this month's column, I thought it would be fun to interview Phil McKinney, my new boss and the CTO of HP's PSG (Personal Systems Group). One of three business units within HP, the PSG consists of roughly one-third of HP's overall $90 billion business. HP and Voodoo will work together, not separately, to build a new gaming unit that will be a part of the PSG.

RS **So Phil, we're here now. Everyone keeps asking us, "Why HP?" Besides the fact that we can leverage HP Labs, there are many reasons and I've covered most of them in the blog. I'm here to ask you: Why Voodoo?**

PM Following HP's gaming machine trail in 2004, we recognized that we needed to go about this market differently than just the normal box play. The market and customers demand a level of performance, support, and trust that would stretch any organization. When you look at the players that are out there that can bring influence, innovation, and brand, there was only one choice.

The other influence on the acquisition was the market desire for the latest technologies. With HP's R&D, the acquisition gives HP a means to deliver breakthrough innovation in the high-performance market served by Voodoo. The technologies that are delivered in this high-end market then will eventually find themselves in our mainstream products.

RS **What kind of changes have you noticed at HP since you joined?**

PM I joined HP about four years ago. Since that time, I've seen HP become more responsive to market needs and the drive to create innovations that matter. Innovation for its own sake is what I call a hobby. Innovations that result in allowing a customer to benefit are the ones that matter.

RS **Do you think the Voodoo brand will get the life sucked out of it?**

PM No. HP is looking for the Voodoo DNA to influence HP and its products.

RS **What is your favorite movie?**

PM The old, original Pixar shorts (pre-Steve Jobs). I'm a nut for computer animation.

RS **I was caught off-guard when I visited your Web site (www.philmckinney.com) and listened to some of your podcasts. Those are pretty awesome man, why didn't you tell me about them before?**

PM When I was first starting out in my career, I was fortunate to have a mentor (Bob Davis) who helped me get started and constantly challenged me to not get brainwashed by corporate think. As part of his mentoring, the only requirement he made was that I "pay it forward" when I was ready. Rather than just do the 1:1 type mentoring (which I do), I started experimenting using the podcast (back in March 2005) as way to share my "lessons learned" about creativity, innovation, and creating successful products.

The results have been overwhelming. I get regular emails from listeners sharing how they've applied the ideas in the podcast along with regular meet-ups with listeners when I travel.

From the start, the podcast and blog were my way of "paying it forward"; they are not affiliated or supported by my day-to-day job. I've purposely kept it a personal project and therefore I don't make a big deal about promoting it.

RS **What do you think Bill and Dave would say if they were around today?**

PM They would be going nuts. From people who I've talked to who worked with Bill and Dave, they liked mavericks. Those individuals who pushed the organization, who didn't accept the easy answer but instead dug into the problem and opportunity until they solved it. It also doesn't hurt that Voodoo, like HP, started in a garage.

I have a favorite quote from David Packard: "Don't be afraid to take risks. If you're not taking risks, you're not reaching far enough." ▲

Holiday Wish List:

1. Access to HP's $3.5B+ R&D Lab. (Thanks, Santa!)
2. To see the U.S. Dollar get back to normal levels.
3. Nintendo Wii.
4. A new WQXGA+ home theater system.
5. A ticket to Gumball with a Ferrari F430 Spyder.
6. To wake up one day and speak five additional languages.
7. Courtside tickets to a Mavericks game.
*8. To see Frank Shamrock return to the UFC and kick some ***.*
9. For the Calgary Flames to win the Stanley Cup.
10. To have all spammers transported to a deserted island with nothing but Viagra to consume.

HP is looking for the Voodoo DNA to influence HP and its products.

Send your opinions to this opinionated guy at rahul@cpumag.com.

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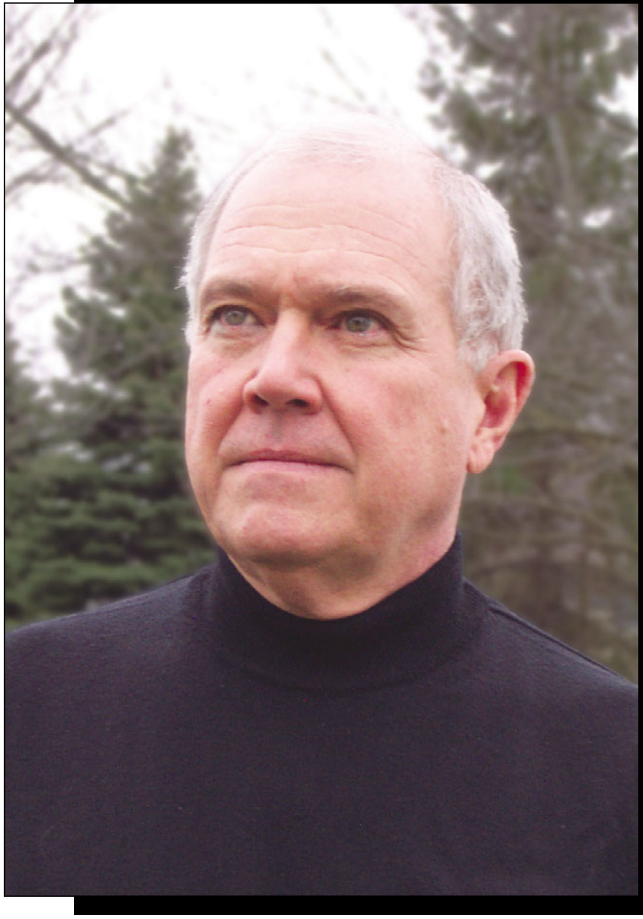
Technically Speaking

An Interview With Craig Cuddeback, Senior Vice President Of Cleantech Capital Group



Craig Cuddeback is senior vice president in charge of marketing, communications, and operations at Cleantech Capital Group. He was previously senior vice president at Small Times Media, a B2B publication and research organization aiming for the globalization of nanotechnology.

by Barry Brenesal

CPU: Let's define 'clean technology.'

Cuddeback: Clean tech is any market-driven technology that provides better utilization of resources, better management of energy, and decreases environmental impact.

CPU: Would it also include technologies that might perhaps still have 'dirty' components, but less so than conventional technologies?

Cuddeback: Sure. Things like clean-burning coal would certainly fall into that category.

CPU: What would be the origins of clean tech in modern times?

Cuddeback: Clean technology has been evolving over time in such things as nanotechnology, microtechnology, [and] other techs that offer better utilization of energy while remaining non-carbon-based. These have been developed through major funding from governments, research in universities, and corporations. Clean tech itself, as a name, is really a category we first defined back in 2002. What we tried to do then was classify technologies that were being driven by market factors, appealing to investors, and 'clean' by definition. This is as opposed to the 'green technology' of the '70s, the environmental-type issues—the 'end of the smokestack tech' technologies that tended to be driven by regulations. The distinction between the two technologies is that clean tech is more market-driven.

CPU: Do you have a problem with clean tech being indiscriminately referred to as 'green' tech?

Cuddeback: Well no, but I think it has a different connotation. There are some groups out there whose members, depending upon their backgrounds and where they come from, might refer to clean tech as green. Clean tech, though, seems to be the one that's been most picked up by the media and investors because of that distinction in market-driven technologies.

CPU: Is it also less politically sensitive, calling it clean instead of green?

Cuddeback: It's about money. People are looking for where they can get their best return. I think that currently the technology has positioned itself where investors realize they can get a competitive return for their investment and still have a favorable environmental impact. It's also a convergence of technologies allowing different aspects of society to get together. In the clean-tech area, while they may not totally agree, government, investors, businesses, and NGOs can find common ground.

CPU: But if clean tech is about money, it can't always be more expensive tech, can it?

Cuddeback: Not necessarily, no. In fact, there are some studies coming out, like from Berkeley, that show some of the renewable energies can create jobs. When we consider the investment required and the cost factors, we find that it is very competitive; especially with the cost of fossil fuels what they are now.

CPU: The Cleantech Venture Network site says that 'clean tech is surging ahead of the two previously dominant venture investment categories, telecommunications and medical. During the most recently reported quarter, it now ranks third behind biotech and software, indicating that it is shifting into the mainstream.' But because the changes it discusses are primarily reflecting Q1 and Q2 of 2006, isn't it a bit premature to break out the champagne?

Cuddeback: Well, we are amazed by the growth in that area: 2005 represented a 35% increase of venture investment over 2004, so things were really starting to ramp up significantly last year. In the fourth quarter of 2005, venture investment in clean tech actually surpassed semiconductors in fifth place. We've had eight consecutive quarters of growth, as well. Of course, since we're dealing with venture capital, I can't say that we're going to sustain that rate, or that we may not have down quarters here and there, in terms of investment. But I think it's to say that the trend overall is positive because we're looking at more than 300 IPOs out of the clean-tech area over the next few years. That puts us on track for a projected investment of $8.7 billion between now and 2009 by the venture community into the clean-tech space. Are we going to see the same rate of growth in the near future that we've seen the first two quarters? Probably not, but I think we'll see a continued, sustained positive trend.

CPU: One of the major areas of clean-tech investment is energy. Would it be safe to assume that with soaring oil prices, clean tech begins to seem more and more attractive to venture capital?

Cuddeback: Yes, that's true. But the investment dollars going into renewable energy are also allowing new technology to be developed that will make it faster, better, cheaper, which is the nature of the emerging technology area. So, for example, you're starting to see things like wind turbines for neighborhoods, personal use, small groups, and farms, with new opportunities in the later stages of the market requiring smaller investment.

CPU: You're saying, in essence, that there's a knock-on effect from increasing anxiety in the fossil fuel markets?

Cuddeback: Sure. If you look at the major energy companies—BP, Shell—you will find that they're all hedging their bets on energy investment, as well. I don't think the consumer really cares whether it's private investors or Shell Oil, as long as their energy requirements are being met in a cost-effective manner.

CPU: How do you determine whether a company is truly clean-tech? Do you use specific criteria for evaluation?

Cuddeback: Yes we do. We examine each merger or acquisition and try to make that determination. I think much of the technology that's been recently developed is clean by definition (if you use the definition we've already discussed, concerning a positive impact on the environment). But where the distinction occurs is when we consider whether the company has invested in areas that are consistently producing technologies, products, and services that are clean in nature—or offer a growth potential in an industry segment where significant revenue can be generated from that, even if it's not the primary revenue source for the company. From the company's perspective, are they truly a clean-tech company? For example, General Electric is looking at initiatives, which, while sizable in terms of income and revenue generation, when compared to the overall portfolio are a relatively small percentage of their revenue.

CPU: Have you ever had to turn down an organization that approached you for venture capital sponsorship?

Cuddeback: Yes, we do it all the time. We get hundreds of business plans from companies that want to make a presentation in our business forums each year. We whittle that down to a total of 60 for the year for three forums. At any time, we have a pool of over a hundred companies that we really consider clean-tech, so we're pretty discriminatory. We evaluate each of the deals that are being done.

CPU: I noticed you mentioned in your curriculum vitae that you were previously with Small Times Media, a research organization targeting the globalization of nanotechnology. Now, that also is a field that's an example of emergent opportunities for clean-tech energy. Have you had any venture capital investment in that?

> Clean tech is any market-driven technology that provides better utilization of resources, better management of energy, and decreases environmental impact.
> —Craig Cuddeback

Cuddeback: Nanotechnology was a unique field to be involved with because it was heavily funded by government sources and really had driven a lot of growth within university and national laboratories. It was interesting watching it develop as a technology, creating interest in a lot of other sectors and industries. The technologies developed in that space are certainly an important part of clean tech.

CPU: Who is typically looking to drop venture capital into clean technology these days? Is there a recognizable profile on those individuals or companies?

Cuddeback: Not any longer. While venture capitalists tend to be the leading indicator of industry growth or change, in terms of where they're investing and amounts of money, you're also finding now pension funds like CalPERS and CalSTRS and large corporations like GEDD and Shell making major investments in those areas. Governments are looking at ways to drive the growth of technology by being consumers of clean tech and by specifying them in their acquisition of materials for cities (for example, Seattle, where they're trying to put more emphasis on renewable energy). We're observing more and more municipal governments looking at clean technology for ways to decrease their dependency on fossil fuels.

That's why we say clean tech is mainstream. We're beginning to see it all over. Even angel investors, who are typically looking for local investments, are coming into the clean-tech space with startup companies and seed money.

CPU: What amount of money are you seeing venture capitalists bring to clean tech these days?

Cuddeback: The average deal is pretty competitive with overall conventional capitalism. For last year it was about $6.6 million. This year is running a little bit higher because of some of the larger deals being done in the energy area.

CPU: The companies you focus upon appear to be largely national or regional. Are you seeing any international money in the field?

Cuddeback: Europe's doing very well. They're running about 50% of clean-tech investment in North America. Their second quarter was a record for them in venture investment. Europe has always been 'green' in terms of a lot of things they've done, such as wind energy, and now we're seeing it in other renewable energies, as well.

CPU: What about Asia?

Cuddeback: I don't have good data on that, but we are seeing some strong initiatives; for example, some things are coming from the central government of China. One of the three major areas of interest for them is environment, where they have some important matters to deal with as they move toward hosting the 2008 Olympic Games.

CPU: I would think China would be an extremely difficult turf for clean-tech advocates to work, rather like pushing a 10 mile-wide ball of Silly Putty uphill.

Cuddeback: Yes, you experience some unique opportunities there. China, specifically, because of the nature of the government: The direction they're going and who's going to be investing are just what we're trying to figure out. We're observing more IPOs out of China in the solar area, so there's some really good potential there. We consider it as a major growth area because of the central government's initiative to take a greater part in environmental issues.

CPU: You have referred to clean tech as offering a competitive return, and you've mentioned this in both the short and long term. Would you recommend clean tech for a short-term turnaround of capital to a venture capitalist?

Cuddeback: Short term, I guess, is a relative term. If you're looking at five to seven years then I'd say certainly. There are some really good opportunities. But if you're expecting something to flip in the course of a 12-month period, then I'm not sure.

CPU: Is there a lot of competition in your business?

Cuddeback: Not right now. There will be, judging from expanding businesses such as investment banks and the research they're doing centering on the IPO market. We consider that as healthy. They tend to be more focused on energy, whereas our interests tend to be across the spectrum of 11 clean-tech categories.

CPU: We didn't see 11 categories, but only six or seven on your Web site.

Cuddeback: We're revising those. The ones you don't see on our Web site that are legitimate categories break open energy, which is four segments: energy generation, energy infrastructure, energy storage, and energy efficiency.

CPU: It seems like you're expanding and clean tech is expanding, so all is well. But is there any downside to it at this point?

Cuddeback: Just that people need to be careful with their investing. Anytime you have a hot area that is getting a lot of attention, there are going to be some investments made that probably shouldn't be. These investors are the same group of people that came through the dot-com bubble, so I think they're wiser, looking at things a little more closely; still, there will be problems. Just be very careful, and look at the basic fundamentals of business investment. If you follow those, you should be in good shape. CPU

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by Kristina Spencer

Under Development

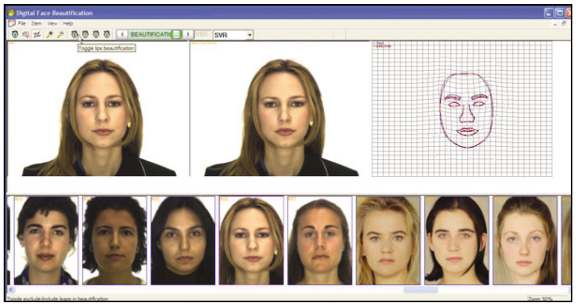
A Peek At What's Brewing In The Laboratory

One Click To A More Beautiful You

We take for granted that photos of models and movie stars that we see in magazines have been retouched to the *n*th degree, with all blemishes, uneven skin tones, and hints of a double chin artfully erased. And with the ubiquity of digital cameras and consumer photo-editing software, you don't even have to be a professional to make your aunt's unsightly mole disappear from family snapshots.

These surface changes, while smoothing over imperfections, still leave subjects with the faces they were born with. But even that might soon be up for debate. Researcher Tommer Leyvand and his colleagues at Tel Aviv University have developed software to digitally beautify faces in photographs by applying an algorithm that alters the positions of a subject's facial features, bringing the geometry closer to that of faces rated "more attractive" by human raters.

The research team intends the software to make very subtle changes that increase the face's beauty rating, while keeping the subject recognizable. The program maps facial features of an inputted image and searches the database for nearby feature points that correspond to a face rated as more attractive. Then, it moves the feature to its new position. For example, the software might even up the eyes, adjust a jaw line, or thin or thicken the lips or nose. The program makes changes in real time, and the user has control over the degree of beautification, as well as the ability to exclude features from the algorithm.



Digital beautification software goes a step beyond airbrushing, actually modifying the positions of a subject's facial features to create a more attractive facial geometry.

"The algorithm takes into account 234 facial distances between 84 facial features when beautifying," explains Leyvand. "It currently only operates on the facial geometry, and this is the revolutionary part that allowed us to achieve these new results."

Leyvand's team is currently putting together a Web-based version of the software that allows users to upload an image and get a beautified result, and future research plans include improving the algorithm to support other expressions for use on video sequences.

Leyvand notes that although they are looking into commercialization options, it's too early to predict when a consumer version might be available. ▲

Extending Moore's Law Molecularly

In the latest, greatest hope for extending Moore's Law as silicon electronics reach their physical limits, researchers at IBM's Zurich Research Laboratory have demonstrated that a single molecule, measuring approximately 1.5nm in length, can be switched between distinct "on" and "off" states. This finding lays the groundwork for future molecular electronics that could one day replace current silicon-based CMOS technology.

Using an MCJB (mechanically controllable break-junction) technique to isolate an individual organic molecule, BPDN-DT, between two electrodes, the team, led by Heike Riel and Emanuel Lörtscher, applied voltage pulses to switch the molecule's state, with "on" and "off" corresponding to the 0s and 1s that make logic and memory operations possible in current electronics. Both states were stable, and allowed for repeated write-read-erase-read cycles. Overall, more than 500 switching cycles were measured with switching times of around one microsecond.

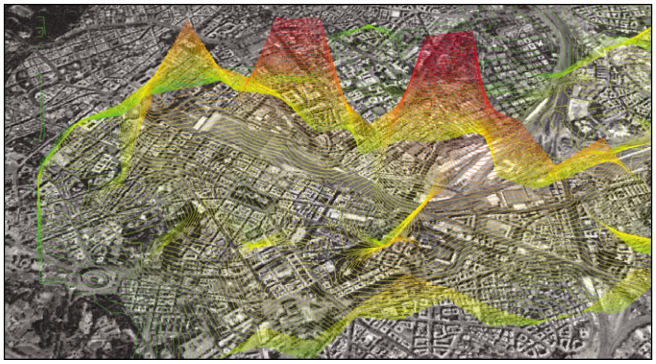
"We have doubtlessly shown that the switching observed is truly of molecular origin and demonstrated that the single molecule can function as a memory element," explains Riel when asked about the significance of the team's results.

Riel continues,"Molecular devices seem to be ideal candidates for future nano-electronics, as they possess the potential for creating high-density devices with low power consumption in combination with high speed.

Moreover, because of their internal molecular structure, molecules may provide novel intrinsic functionality not found in today's silicon electronics." The single-molecule switch is still in the very earliest stages of research; next steps involve the team gaining a better understanding of the switching mechanism. Riel believes that molecular electronics could first provide a supplemental boost to current technology before fully replacing it.

"At the first stage, devices based on molecules might be an add-on to silicon chips to give some extra functionality," says Riel. ▲

Mapping The Pulse Of A City



Rome, as we've been told, wasn't built in a day. But the real-time, mapped flow of the modern city's people, as tracked on cell phones and other wireless devices, is on display at the Venice Biennale, a biannual contemporary art exhibition.

The project, dubbed Real Time Rome, is the brainchild of MIT's SENSEable City Lab, a research initiative that studies the impact of new technologies on cities. The project's goal, explains director Carlo Ratti, is to use the wireless technologies that connect us to better understand the patterns of life in Rome, and in doing so, to gain a better understanding of how modern cities function.

"Our hope is that projects like Real Time Rome will give city dwellers more control over their environment by allowing them to make more informed decisions about their surroundings," says Ratti in an MIT press release.

"Imagine being able to avoid traffic congestions or knowing where people are congregating on a Saturday afternoon. In a worst-case scenario, such real-time systems could also make it easier to evacuate a city in case of emergency."

Ratti and SENSEable City Lab obtained the aggregate data used to create the various maps from devices such as cell phones (via Telecom Italia, the primary sponsor of the project) and GPS units on public transportation systems. By combining real-time data with GIS data and raster images, SENSEable City Lab created maps showing how quickly people moved around the city, which directions they moved during different times of day, and even how people shuffled around Rome before a Madonna concert and in the hours following Italy's World Cup win.

All data used in Real Time Rome was anonymous, but projects such as this bring into focus issues of privacy and personal control over communications and location data that need to be addressed as real-time mapping systems become more widespread. Recognizing the need to discuss these issues that widespread real-time mapping systems could create, To MIT will be establishing the SENSEable City Consortium. The group will bring together telecom companies, hardware producers, public officials, and urban physical infrastructure manufacturers. ▲

A Robot With A Discerning Palate

If you enjoy a good glass of wine but can't tell a Bordeaux from a Beaujolais, help may soon be on the way. Researchers from both NEC System Technologies and Mie University in Japan have developed a robot that can analyze and identify different wines, provide information on their flavors, and even suggest which wine you might most enjoy based on a series of questions it asks to establish your personal taste.

The so-called "winebot" uses infrared spectral analysis to "taste" and differentiate between wines. When its IR sensor comes in contact with the surface of a wine, it conducts an analysis of the wine's chemical composition based on the absorption rate of IR rays and compares the results to those it contains in its catalog to determine a match. The catalog also stores tidbits of information the robot can present, regarding brand, taste, and what foods could accompany the wine.

The blue-and-white sommelier is actually the second iteration of the robot the research team developed. The original robot, exhibited in mid-2005, was able to identify various foods, analyzing their chemical makeup, and give advice on the food and potential health issues associated with eating them. However, teaching the robot to be a wine connoisseur was more difficult.

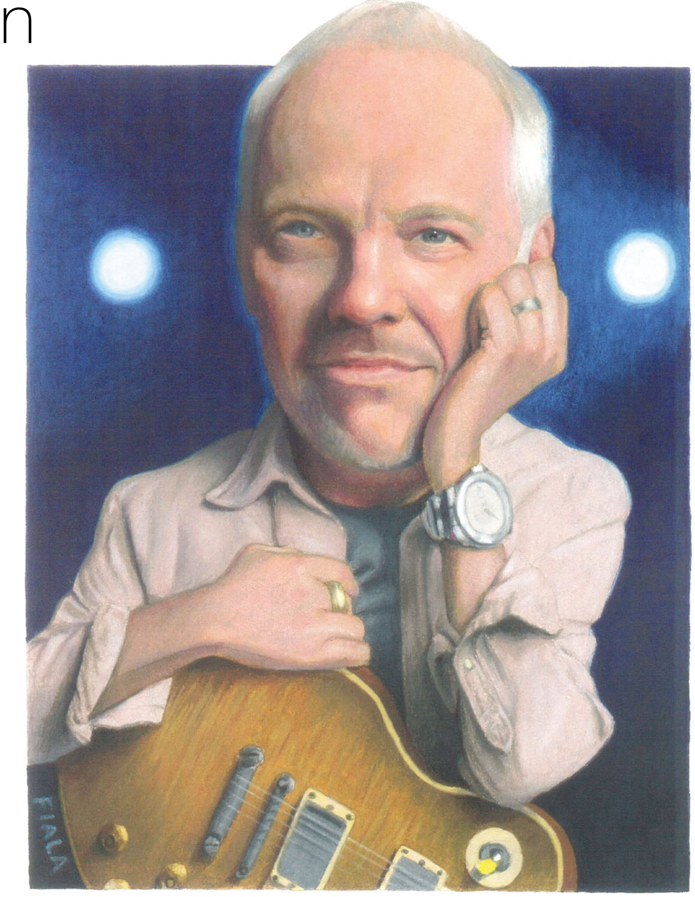
"After analyzing wines using the IR sensor, we recognized that many of them are very similar, says Hideo Shimazu, director of the NEC System Technology Research Laboratory and co-leader of the project. "Both our previous IR sensor and our previous pattern recognition program couldn't discriminate each of them although their capabilities were enough to classify various cheeses and other foods. For example, some $100 French wines and $5 Chilean wines were too similar to differentiate them."

In order to overcome this limitation, the team improved both the discrimination algorithm and the resolution of the IR sensor, which now covers the range between near-infrared rays to mid-infrared spectrum. Although this has improved the robot's ability to differentiate between wines, it has also increased the size and cost of the sensor, an issue that the team is still working to resolve.

The team's goal is to market the robot as soon as they reasonably can, but Shimazu warns that expectations of the robot's current capabilities are perhaps too high.

"Our robot can now differentiate only [10 to 20] different wines." ▲

Q&A With Peter Frampton



If you need an introduction to Peter Frampton, then you must not have been paying much attention to music these last decades. Thirty years after the debut of his breakthrough album, “Frampton Comes Alive,” it’s still cited as the best-selling live album of all time.

And this self-described gadget freak continues to work at a creative peak. His newest release, “Fingerprints” (A&M/NewDoor), is an instrumental album that Frampton calls “the CD I’ve been waiting to make all my life.”

Q **If “Fingerprints” is the CD you’ve been wanting to make all your life, what took so long?**

PF I’ve asked myself that question. I think timing, and realizing that I wanted to do something that took me out of the box altogether, that was a real challenge, something completely different.

Q **Do you plan on doing another project like this one?**

PF I enjoyed doing this one so much because it was a challenge, as opposed to being stuck in a rut. I’ve realized through doing the instrumental record that everything I do from now on has to give me that same challenging feeling.

Q **I understand that you’ve been really enthusiastic about embracing digital recording technology. Although, according to the liner notes, you’re still recording to 24-track analog tape first. You’re not ready to give up that tape sound?**

PF No. It definitely gives the drums and bass a sound of their own.

Chuck Ainlay, the engineer that did this record, on the album before this, he brought [Steinberg’s] Nuendo [digital audio workstation] with him. After he left, finally I realized “I’ve got to make the jump.”

Chuck said to me, “I can introduce you to Charlie Boswell and Kelly Stuart from AMD [Digital Media & Entertainment], and I’m sure they’d love to help you out, if you want to make the change.” They have been unbelievable. Their main aim is to take the tech out of the computer to make it easier for the artist to express himself, and not worry about the tech side of it, so that it doesn’t get in the way of the music.

Q **I saw that a couple of tracks had parts that were done in Apple’s GarageBand. How did that come about?**

PF It’s so easy, and so quick, that when I’m writing, I’ll find a loop in GarageBand once I’ve written something, and when I want to put it down, that’s the quickest setup. It’s all about what takes the shortest amount of time to get the idea down, and GarageBand is that. I’m a Mac guy when I’m with my laptop and my home stuff, but the studio is fully PC. I can see the benefit of both.

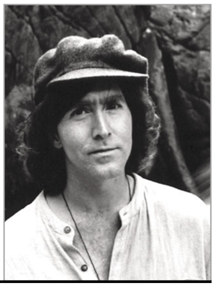
Q **What advice would you give people who may be just starting to get into digital recording to do their own music?**

PF It’s the same with any type of recording. I’ve always found that you try and get the best possible sound in the room before you even go into the digital world. But there are a lot of guitar and keyboard players that don’t use a Leslie [rotary amplifier], don’t use a [Hammond] B3 [organ]. They use the [Native Instruments] B4 [software organ], which is also amazing. They go straight in and it’s all virtual. A lot of guitarists and bass players plug straight in and use a modeling amp which is in the program, and that’s good, too.

As long as you’ve got the knowledge of what the real guitar sounds like through the real amp, what the real piano sounds like in a real room … I think it’s important to experience that before you get wrapped up in digital. ▲

Subscribers can go to www.cpumag.com/cpudec06/frampton for bonus content.

In addition to his contributions to various Sandhills publications, Brian Hodge has published several novels and short story collections, explores digital photography, and experiments with music and sound design in a home studio. Computers aren’t his life, but they sure make it a lot easier.



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